COMMUNICATION WITH THE PATIENT

AINSLIE MEARES
M.D., B.Agr.Sc. Melb., D.P.M.
OF MELBOURNE, AUSTRALIA

THE patient comes to us. He tells us his symptoms. We in our turn make further inquiries as to the development and duration of his complaints, and we inquire about emotional factors in his life. Students are taught that this is history-taking; and it is emphasised that the patient should be given time to tell his story, and that we should be sure to obtain a full account of his past illnesses, as well as the family medical history.

However, it is only in the very simplest cases that a medical consultation can follow this plan. When there is a psychosomatic component in the illness, the patient almost always skirmishes. He mentions a few inconsequential symptoms while he sums us up, in order to see if we can be trusted with the real complaint. We soon learn that his past illnesses and his family medical history seem irrelevant to the patient; and any early inquiry into these matters only puts him against us. We learn that while he is talking of one matter, the patient unintentionally informs us of other matters. The whole business of communication with the patient is something much more complex than our traditional concept of history-taking. In fact, we could liken it to a multi-channel system of communication between patient and physician, when each separate channel is communicating different information at the same time.

The Means of Communication

Literal Verbal Communication

The patient tells us about his complaint and about himself by the logical use of words. This is obvious. However, it is the very obvious nature of logical verbal communication which is likely to mislead us in history-taking. It is likely to divert our attention so much that important information which is communicated to us by other channels goes unheeded. For instance, it is advised that an effort should be made to correlate the development and exacerbation of symptoms with events in the patient's life story. These facts are communicated by the logical use of words. The danger is that, in our eagerness to obtain this important information, our attention will be diverted from other equally important communications which are being given to us at the same time.

Extraverbal Communication

I have come to use this expression to cover the communication of ideas which are conveyed by the implied meaning of words, as distinct from the logical content of the words. This is the meaning which we gather from reading between the lines, as it were. There is no logical statement of the idea. It includes innuendoes, and those ideas which are communicated by the simple fact of their omission. Extraverbal communication is commonly made by the stress which is given to certain words, or by the tone in which they are spoken. On most occasions, the spoken words thus come to communicate two quite different ideas—the logical and the inferred meaning. Extraverbal communication is biologically a recently acquired ability. It is lost in conditions involving regression. This accounts for some of the difficulty of communication with the schizophrenic. Because we are so accustomed to it, we unthinkingly use extraverbal means of expression, and the patient cannot comprehend our meaning.

Unverbalised Phonation

This is the language of grunts and groans, of " Ums " and " Ahs ". We must never let ourselves drift into the way of thinking that these are just the noises that a patient under stress of pain or emotion is likely to make. Unverbalised phonation has meaning. The ideas conveyed are never as clear and precise as those communicated by the logical use of words; but if one closely observes abreacting patients it is seen that quite subtle shades of meaning are often communicated by these grunts and groans. Unverbalised phonation is more primitive than verbal communication, and comes to be used most by patients who have undergone some degree of psychological regression, either as an acute reaction to stress of emotion or pain, or as a more chronic reaction. Unverbalised phonation is used to communicate primitive ideas of biological importance—love and hate, pain and fear, joy and sorrow. If then the physician is in doubt as to the exact meaning which is being communicated, it usually becomes clear if the patient's prevailing affect is taken into account.

Expression

For the most part, the patient's affect is communicated unconsciously by his expression. Anyone can tell from the patient's expression when he is very frightened, or in great pain, or is terribly anxious. But expression also communicates very much more complex ideas. The patient may consciously use his expression to communicate with us. For instance, he may assume a calm expression or an appealing expression. An important factor is that our expression is under only very incomplete voluntary control. This means that it is used by the patient to consciously communicate ideas; but it also unconsciously communicates ideas, unbeknown to the patient; and, very important, it sometimes communicates ideas of which the patient is aware, but which he tries not to communicate. It is important to learn to recognise to which category the patient's expression belongs. Very often one is superimposed upon the other. Thus the patient may have a basic involuntary expression of fear, and on top of this he may consciously impose a " please don't hurt me " expression. Very often we can see that the patient is consciously assuming a composed expression, but at the same time we see in it the unmistakable signs of anxiety. A young man may tell us about his father with apparent nonchalance, while the tensing of his lips and a slight change of colour communicate the conflict which his words deny.

Posture and Gesture

In the same way, some elements of the patient's posture and gesture are consciously produced in order to convey meaning to the physician. The man who sits down, crosses his legs, and lights a cigarette is telling the physician how relaxed and composed he is. It is important to appreciate such communications, as usually it is only an insecure person who has need to express himself in this

way. My own observations indicate that many business executives consciously cultivate a relaxed posture and expression to cover up a good deal of anxiety. The position of the wrist and fingers is often a valuable sign. If the patient's hand projects beyond the arm of the chair, the wrist falls into a fully flexed position if the patient is really relaxed; if there is much anxiety, the wrist remains extended.

Behaviour

A person performs some act to carry out some purpose in reality. We are inclined to think of behaviour as a sequence of such purposeful acts. But we must not forget that any act carried out in the presence of others is very often used as a means of expression, as well as fulfilling its purpose in reality. The way in which the act is carried out is used as a means of communicating some idea. As a very simple example, a child is told to do some task which he does not want to do. The child does the task, but does it in such a way as to make it clear that it is done under protest. Behaviour expresses the idea as clearly as words. The Army uses the delightful phrase "dumb insolence" to cover this type of communication. In a similar way, the patient uses his behaviour to communicate. Much valuable information can be obtained in this way.

The main difficulty of communicating by behaviour in medical consultation is that an interview does not allow the patient much freedom of behaviour. We learn more from a patient's behaviour when we come to the physical examination. The patient may have given little indication of his inhibited nature until he is asked to take off his clothes. In this respect, we must not forget that many inhibited persons overcompensate, so that a patient whose behaviour leads him to a rather blatant exposure of his nakedness may in fact be extremely inhibited. We must read the communication correctly. It surely means, "I shall show him I am not shy and sensitive about these things".

There are some facets of our behaviour which are particularly important as non-verbal communication. The way in which we greet the patient is significant. We must be careful not to greet inhibited patients too warmly; for they are afraid of close emotional contacts, and if they are approached too closely, they withdraw into themselves. Touch is a particularly significant means of non-verbal communication. To take the patient's hand when he is struggling with emotion gives him the feeling that somehow his problem is shared with the physician. Any attempt to communicate the same idea by the logical use of words is hopelessly awkward, and embarrasses the patient. On the other hand, any inept use of this mechanism, which might bring us to touch the patient in inappropriate circumstances, only informs the patient that we are insensitive to his state of mind.

In another way, it can often be seen that the various elements of the patient's behaviour fit into a pattern, so that he is seen to be playing a role. This in itself is a communication to the physician. The patient may assume a role of importance. The meaning may be: "You can see I am an important person, you must treat me as such". The physician in his turn thinks: "What makes him so insecure?" It may be that the patient's behaviour communicates the idea; "I need your help very badly, please do not let me down". In such a case, the physician moves closer to the patient emotionally, so as to support him.

Sometimes the patient behaves in such a way that he is really communicating with the physician by means of symbolic acts. There are grades of such symbolism. It may be the conscious symbolism of everyday convention, or it may be deeply unconscious. The offer of a cigarette is a conventional symbolic act communicating an offer of friendship. The behaviour of a regressed schizophrenic may be a communication in terms of Freudian symbolism.

When we are considering the patient's behaviour as a means of communication, we must remember that the situation may be complicated by transference phenomena. A hostile reaction to an authoritative physician may be a release of emotion felt for an authoritative father, but transferred to the physician.

Primitive or Sophisticated?

The different channels of communication really belong to different periods of biological development. Thus non-verbal communication in general is more primitive than logical verbal expression; and extraverbal communication is more recent, more advanced, than logical verbal expression. However, there are some non-verbal communications which are quite sophisticated. This type of communication is seen to good advantage in a well-acted modern comedy. There is no basic simplicity about these communications. They are witty, cute, and subtle. This type of non-verbal communication is culturally determined, and is quite distinct from the primitive type. Sometimes the patient will use this type of communication in his initial testing out of the physician. An important point is that the prepsychotic schizophrenic loses his ability to follow this type of communication. This is one of the factors which go to account for his general bewilderment. On the other hand, even when the illness is well advanced, he retains the ability to use the primitive type of non-verbal communication, and this becomes an important means by which the physician maintains contact with him.

Silence

As regards behaviour, there is another point. Silence and the lack of activity does not necessarily mean an absence of communication. Silence is readily used to express hostility; but it can also express sympathy and understanding. In itself it is an aspect of behaviour, and in certain circumstances may be charged with meaning which the sensitive physician is able to interpret.

Content of the Communication

The Conscious Communication of Fact

This consists of all the ideas which are communicated by the logical use of words. It includes the patient's description of his symptoms, the details of his life story, and the logical correlation of this information. This is what some teachers regard as a psychosomatic history. Such a view is obviously too circumscribed, since it ignores pertinent information which is available by other channels of communication.

The Unconscious Communication of Conflict

The successful treatment of any illness which is emotionally determined centres around the recognition and resolution of psychological conflict. Basically, we recognise psychological conflict when we observe disturbed emotion in the patient at a time when we know that he has some particular thought in his mind. In actual practice, this information usually does not come to us as a single communication. Different elements are

communicated through different channels. Thus a common situation is that we learn what ideas are in the patient's mind from what he is saying; but the emotion concerning these ideas is usually communicated non-verbally. The patient talks of his father, and at the same time his anger is communicated extraverbally by his manner of speech and non-verbally by his expression. The introvert youth talks of his mother, and by the slowing of his speech makes an extraverbal communication of the emotion which he feels for her. The girl talks of her boy, and tells us he was only a friend, but her expression communicates her emotion. The business man talks of his work, of his office, and then of his secretary and there is a change in his expression. In other cases, the actual thought content itself is communicated non-verbally. With the patient who is composed during the interview, but who shows anxiety at the prospect of physical examination, his behaviour and his posture show that his thought concerns his body, probably the sexual part of his body; at the same time his emotion is communicated by his expression, his gesture, and other elements of his behaviour.

Communication of Affect

We may discover the way the patient feels, his mood, by all or any of the channels of communication. In this respect, logical verbal communication is often particularly unreliable. Many hysteroid persons say that they feel terribly depressed, when in fact they are not suffering from psychological depression. The patient is not consciously lying. It would seem rather that the statement should be accepted, not at a logical verbal level, but rather as an extraverbal communication meaning that his difficulties are so great that they should cause anyone to be depressed. More important are those mildly depressed patients who insist that they do not suffer any depression. Some people of rather sterling character feel that depression is weakness of mind, and sometimes they will deny to the physician and to themselves any feeling of depression. However, their affect is clearly communicated by their expression, their posture, and their behaviour.

Communication of Attitudes

During life we develop certain definable attitudes towards various matters. During the interview, if he is given a chance, the patient will communicate these attitudes to us. It is important that we recognise them, for they often lead us to the area of significant psychological conflict. Furthermore, we have to give consideration to the patient's attitudes in our medical management of the case. His attitudes towards religion, sex, family life, and morality will influence us in the way in which we approach these matters with him. These attitudes are usually communicated by the patient talking of some subject, and at the same time unconsciously disclosing his emotion by non-verbal means.

Communication of Habitual Patterns of Psychological Defence

We must remember that in the initial part of the interview, the patient is almost always on the defensive. There is something personal about consulting the doctor. He is a little ill at ease. It may be that deep down he associates his complaint with guilt about things he has done. During this phase of the interview, the patient unconsciously communicates to us the nature of the psychological defences which he habitually uses in his everyday life. He may keep holding himself in check; he may want to withdraw; he may assume a superiority; he may be ingratiating and over anxious to please; he may show an ill-disguised aggression.

Appeals and Threats to the Physician

Communications of this nature are surprisingly common, but they are seldom made by the logical use of words. The visit to the doctor is often more disturbing to the patient then he himself realises. He is driven to make frantic appeals. His pride and social convention prevent their logical expression in words. The ideas are so humiliating that he is not fully aware of the content of the communications. "I am so weak; you are so strong; help me." "You see, I have had such an unhappy childhood, it is not all my fault." "If you don't help me, I will kill myself."

Communication in Different Conditions

In our everyday life, we notice that some people show a tendency to use one channel of communication in preference to others. These tendencies seem to be determined by racial and cultural influences, as well as by individual personality structure. Thus a Parisienne actress quite naturally uses the non-verbal communication of expression and gesture in a way which would be considered pathological in a Scot. Persons in any culture who are inhibited, rigid, and precise tend to emphasise the logical use of words. Some intelligent people of subtlety favour the extraverbal channel, and communicate many of their thoughts by the meaning between the words, rather than by the meaning of the words themselves. The person with a free-flowing emotional life is continually communicating, by expression and behaviour, all those shades of feeling which simply cannot be adequately expressed by the logical use of words. In dealing with our patients, these are all matters which must be taken into consideration.

However, in certain types of psychiatric conditions, there are quite gross changes from one type of communication to another. Thus the early schizophrenic soon loses his capacity for extraverbal communication and sophisticated communication by means of his behaviour. As his illness progresses, his logical use of words is impaired. He falls back on other means of communication. He uses words to communicate by virtue of their symbolic significance, and not the logical meaning of the words themselves. When there is regression in schizophrenia, the patient relies more and more on non-verbal communication. This is just what we should expect. He is returning to childish and infantile patterns of behaviour; so we might anticipate that he will communicate with us in the same way as would a child or infant. We must not dismiss the matter by recording that the patient is behaving in a peculiar way; we must recognise that he is using a different channel of communication, and we must tune in, as it were, so that we can read his message clearly. The way in which we tune ourselves in to such communications is the whole art of psychotherapy with psychotic patients.

With the case of mild involutional melancholia, the expression and posture will often communicate an unmistakable feeling of depression which the patient may deny in words.

Other patients also show a very definite choice of certain channels of communication. For instance, the obsessive is essentially meticulous, rigid, and precise. He likes to use words logically. Nevertheless, his communications by this means often do not convey his meaning very clearly. He is characteristically given to doubting. As a

result of this, he finds that he has to repeat to us so many inconsequential details that the main burden of his communication is lost in the process. This, of course, is one of the difficulties of psychotherapy with obsessives. But in addition to his liking for logical verbal communication, the obsessive shows a strong tendency to make unconscious symbolic communications by means of his obsessive rituals and compulsive acts.

As opposed to the obsessive, the hysteric favours non-verbal means of communication. When we are interviewing such a patient, we must always expect the really important ideas to be communicated by expression and behaviour; so we must guard against being misled into paying too much attention to the logical content of what the patient is saying.

It is well to note that the anxious patient often employs the logical use of words to maintain a conscious stream of communications about symptoms and superficial conflicts. These communications are in reality a defence. The patient is unconsciously driven to keep talking in order to prevent the physician from inquiring into matters which are painful to the patient.

The Physician Communicates with the Patient

The patient may discuss his symptoms quite readily; but when it comes to matters of his emotional life, he is often inhibited and reluctant to talk. We have to keep the interview going, and bring him to disclose his psychological conflicts. This is the art of interviewing. We keep the patient talking by appropriate unverbalised phonation in the form of interrogatory grunts. By this means we inform him that he has our undivided attention, and that we are waiting for him to quietly tell us the worry on his mind. We must convey ideas to him that he can trust us, that we understand, that we are not hostile to him for his shortcomings. The ideas are communicated non-verbally, by our manner and behaviour. The way in which we lapse into silence, and the way in which we touch the patient, are particularly significant in making communications of this nature.

Our therapeutic communications with the patient include the establishment of rapport. This is the doctor-patient relationship which allows of effective psychotherapy, and which we can purposefully manipulate to the patient's advantage during the different phases of our interviewing. This is an emotional relationship and is established by the extraverbal and non-verbal communication of emotion, by the way in which we talk with the patient and our behaviour towards him.

In our actual treatment, we may find that we can help the patient with suggestion in one form or another. An essential factor in suggestion is that it is the process which determines the uncritical acceptance of ideas. Hence, if we would use suggestion, we must convey the idea to the patient in a way which does not arouse his critical faculties, which would put a stop to the operation of the process of suggestion So ideas which we want to convey to the patient for this purpose should be communicated by non-verbal means as far as possible.

We may wish to give the patient insight into some particular matter. We must always let it come to the patient. Even if it is quite simple, a logical verbal communication of insight is usually rejected by the patient, and only produces anxiety and hostility. We must talk around the subject. We communicate extraverbally and non-verbally until the cold logic of the situation comes to the patient.

At the conclusion of the first interview, the physician must make some kind of a statement to the patient about his condition, and how the physician proposes to help him. This is a logical verbal communication. However, the physician must do something more than this. He must reassure the patient. This is an important part of doctoring. It does not mean that we tell the patient that he will soon be better, when in fact we know that he will not. It means that we communicate the idea to the patient that we understand him in his trouble, and that we will help him and stick by him through to the end. Such an idea cannot be adequately conveyed by the cold and logical use of words. The patient leaves us without ever mentioning these things, but he knows them to be true from our behaviour, and the general way in which we have conducted ourselves with him.

Some Practical Considerations

Barriers to Communication

These operate at different levels of psychological integration, according to the nature of the ideas concerned. The most superficial barrier is simply the feeling of shame or hurt which prevents the patient from expressing some matter which he finds humiliating. The physician removes this barrier by establishing rapport with the patient, so that he feels he can trust the physician with his personal secrets.

The next barrier arises when the significant idea is suppressed. The patient has put the idea out of his mind, and simply will not tolerate the thought of it. This barrier is removed in states of emotion, and in conditions when the patient is off guard. The physician may need to provoke the patient to abreaction before he will communicate this material.

The last barrier is represssion. The significant material may be completely beyond the patient's consciousness. Special techniques, such as free association, hypnosis, or narcoanalysis, may interfere with the repressive mechanism, and allow the communication of these ideas. However, a great deal of repressed material may be communicated unconsciously by the patient by non-verbal means. Thus the latent homosexual may be quite unaware of the nature of his condition. The conflict is completely repressed; yet it is communicated to the physician by the patient's behaviour.

The Physician Makes Inadvertent Communication

We have seen that the patient is unaware of many of the communications which he makes to us. In a similar way, there is real danger that the physician himself may unconsciously make inadvertent communications to the patient. The physician may unconsciously disclose to the patient his own weakness, in a way which causes the patient to lose faith in him. This, of course, is distinct from those occasions when it is wise for the physician to disclose some weakness in order to increase the patient's feeling of trust. There may be something about the patient which the physician does not like. There is always the danger that this might be communicated to the patient by expression or behaviour. A common hazard is the unconscious communication of moral criticism of a patient who discloses his antisocial behaviour.

The Manipulation of Anxiety

If the patient is too anxious, he becomes inhibited, and is unable to communicate freely with the physician. On the other hand, if the patient is free from anxiety, he feels comfortable and secure; and he lacks the motiva-

tion to communicate ideas which are hurtful to him. So the success of a difficult interview depends very largely on the physician's ability to regulate the amount of anxiety which the patient is experiencing. Anxiety is reduced by moving to a closer affective relationship with the patient, by reassurances, by sedation, by relaxation, and by suggestion. Anxiety is increased by emotional withdrawal from the patient, by physical examination, by placing the patient in unfamiliar circumstances, and by inquiry about events in his life which are known to have occasioned conflict.

Manipulation of Affective Relationship

The ease with which the patient communicates depends very largely on his affective relationship with the physician. This relationship is capable of quantitative variations in intensity, and also qualitative variations in nature. Thus there must be a professional relationship, so that the patient trusts the physician, but if it turns into a social relationship, it becomes a barrier to the communication of intimate matters.

Learning the Language

It is clear that the physician who would be sensitive to what is going on in the patient's mind must learn the language of each of the various channels of communication. But he must do more than this. He must learn to use non-verbal communication himself. This is necessary because some ideas can be effectively communicated only by this means. It is the only effective channel of communication for the patient who is under emotional stress, and the patient who has regressed. And in any field of medical practice, the physician is continually dealing with patients in these circumstances.

Summary

There is a multi-channel system of communication between patient and physician. These different channels are formed by literal verbal, extraverbal, and non-verbal modes of communication. The physician receives different messages through different channels at the same time. His attention to verbal communication should not lead him to disregard information available through the other channels. Some ideas can be effectively communicated only by non-verbal means. To understand his patients, the physician should be competent in the language of non-verbal communication.

EXTERNAL SPLINTAGE AS A CAUSE OF MOVEMENT IN FRACTURES

J. H. HICKS

M.B. Birm., M.Ch. Orth. Lpool, F.R.C.S.

SURGEON, BIRMINGHAM ACCIDENT HOSPITAL

THE failure of external splintage to prevent displacement (as shown in figs. 1 and 2) is not uncommon. In a series of 50 forearm fractures Evans (1951) recorded some loss of position in 9. On occasion there can occur a ten-degree angulation or a complete diameter shift in the shaft of a long bone, a considerable pronation or supination twist in a forearm, or a twenty-degree tilt in the lower fragment of a Colles fracture. There was nothing out of the ordinary about the cases illustrated in figs. 1 and 2, and the splintage was orthodox. It therefore seems probable that small movements can occur inside conventional splints, at least in the early stages of treatment, and that when they stop it is not by any virtue of the splint. This suggestion is supported by the occasional case in which the patient complains that he can feel the bone ends moving against each other inside the plaster case, even though the application of his plaster case has followed the usual tenets.

One purpose of this paper is to add weight to the suggestion that small movements in fractures treated conservatively are common. Attention will be concentrated not on deformity of large amplitude—perhaps the result of a single movement, whose undesirable result is merely the abnormal shape of the united bone—but on movement of small amplitude, continually repeated, and not necessarily giving rise to significant final deformity. Elsewhere I have shown that prevention of these movements has an important influence on union and on the final function of the limb (Hicks 1959).

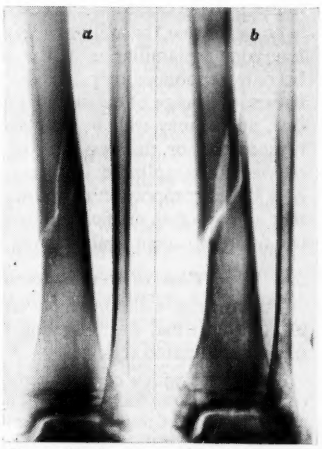


Fig. 1—Undisplaced spiral fracture of tibia (*a*), and same fracture two weeks later.

The experimental work was started with the intention of confirming two clinical impressions:

1. That in the conservative treatment of fractures this movement of the one fragment relative to the other is not due to imperfect technique but to an unsound principle.

2. That continual movement at the fracture site may be present in the early stages, not only in those cases where a permanent deformity becomes established, but in the majority of conservatively treated fractures and perhaps in all.

A third point, which will ultimately prove to be of greater importance, emerged theoretically and was confirmed experimentally. This was:

3. That external splintage can positively *cause* movement (not simply *permit* movement) at a fracture site.

Precise knowledge of what treatment does and does not do is essential in order to correlate it with any observations on fracture behaviour. The fact that movement is usually

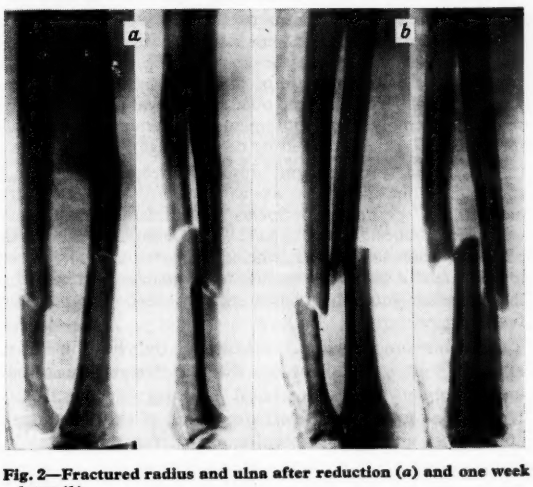


Fig. 2—Fractured radius and ulna after reduction (*a*) and one week later (*b*).

found to have ceased at the end of the period of splintage is no proof that the splintage brought about the cessation. Everyone is familiar with the unsplinted fractures that become spontaneously fixed—that is, united. The natural splintage of callus must have been responsible for this, and it may well be that natural splintage is equally responsible for the cessation of the last few degrees of movement in splinted fractures also. No-one knows in how large a proportion of splinted fractures this occurs—that is, how often artificial splintage plays no part in fixing the fracture except against gross movement.

Passive Resistance of Movement

To investigate the ineffectiveness of a plaster in fixing a fractured tibia, the following experiment was done on freshly amputated legs.

A specimen with a comminuted fracture was taken and was enclosed in a long plaster case. The amputation was through the lower third of thigh, but an orthodox case was imitated as faithfully as possible by completely enclosing the proximal end except for the bone. The plaster was applied more tightly than would ever have been risked in clinical practice, and was moulded with all possible care to give the firmest grip; and it held the knee in the requisite few degrees of flexion. A small window was cut over the fracture site, and through this the behaviour of the fracture ends could be observed. Using only such forces as could be applied by the fingers it was found that

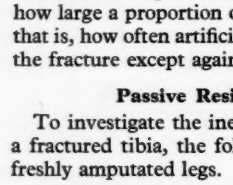


Fig. 3

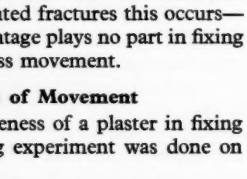


Fig. 5

Fig. 3—Angulating stress produced by a combination of weight and muscle pull.

Fig. 5—Angulating stress, similar to that shown in fig. 4, produced when flexion is attempted against the resistance of external splintage.

Until more than 5° of angulation occurs, the direct splintage effect of the plaster provides almost no protection against angulation.

---

one fragment could be made to shift 2·5 cm. relative to the other. Rotation to the extent of twenty degrees and angulation to the extent of six degrees were just as easily obtained. The forces required to produce the first three or four degrees of angulation or half-centimetre of shift were infinitesimal compared with the forces likely to obtain in clinical practice. Only when considerably larger movements were attempted was any appreciable resistance offered by the splintage.

In a second specimen shift was even greater (over 3 cm.) and compression-distraction was as much as 0·4 cm. Furthermore in this specimen movements of considerable magnitude were also produced by taking hold of the femur and using it to move the whole limb with its enclosing plaster, as would occur in real life if a patient were alternately standing up with the limb pendant and sitting down with the heel resting on the floor.

That movement can occur however tightly a plaster is applied is not surprising since there is always at least half an inch of soft padding material (the subcutaneous tissue, whose function it is to facilitate sliding of skin over deep structures), and in addition often an inch or two of muscle, between splint and bone. Nevertheless some leading authorities act on the assumption that a "properly"

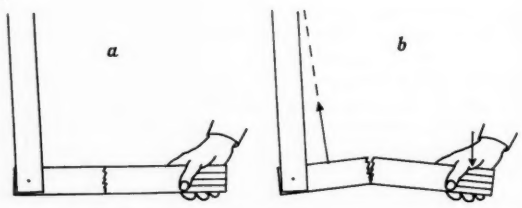


Fig. 4—Angulating stress produced when movement is attempted against resistance: (*a*) no tension in muscle, no resistance, and no resulting angulating stress; (*b*) tension in elbow flexor, resistance to flexion, and resulting angulating stress.

applied plaster case can provide "absolute fixation". The large amplitude of movements seen, even after making ample allowance for experimental imperfections, and the small forces required to produce them, were very revealing.

Occasionally devices such as the three-point plaster described by Charnley (1950) may ensure improved fixation by taking advantage of such inherent stability as may exist in the shape of the fracture. But only when the fracture is transverse or will interlock in a stable manner and when the soft tissue hinge is intact are the conditions suitable for applying the three-point principle. Such cases are in a minority, and the method will not work when the fracture is spiral or comminuted or when the soft tissue hinge is torn.

Production of Movement by Splints

The above movements were produced by more or less artificial forces. There are, however, natural forces arising from the patient's own muscle action. There is reason to believe that these may be redirected by external splintage inwards on to the fracture site and thus cause movement.

The forearm will be used as an example. Fig. 3 shows diagrammatically a forearm held out horizontally, its weight (tending to produce extension) balanced by the pull of the muscles (tending to produce flexion). These two forces create an angulating stress in the bones which would, if they were fractured, result in forward bowing. In fig. 4 the hand is represented as being held still by the experimenter. While the subject is not contracting his muscles the fracture remains free from angulating stress, but when the subject attempts to flex his elbow, and if the experimenter resists the attempted movement (as in fig. 4*b*), angulation again will be produced at the fracture site. In fig. 5 the limb is represented as enclosed in a long plaster case which has a comparatively firm hold on the hand and therefore fixes it to the upper arm as though to a baseboard. In this example the plaster is the agent that provides the resistance to movement so that when muscles act on the proximal fragment angulating stress is produced at the fracture as in the previous instances. Thus it appears that suitable conditions for causing movement at a fracture site are established by the very splintage that is intended to prevent it.

It is not only the flexor muscles that can be the direct cause of movement. In the conditions shown in figs. 4 and 5, resistance is offered to movement of the hand in *any* direction, and a posterior bowing deformity is just as readily produced (by the triceps) as an anterior bowing by the flexors. Alternatively a rotation movement could be caused by the rotators. In brief, wherever a muscle acts on the proximal end of a bone and resistance is offered to movement of the distal end, or vice versa, movement may be caused at a fracture site.

Rotation is likelier than angulation because of the particular inefficacy of a cylindrical plaster case in controlling rotation. The operative forces can be demonstrated fairly convincingly by anyone on himself.

If, with the arm free and elbow partly flexed, pronation and supination are attempted, the hand will pronate and supinate readily. No stress occurs in the forearm bones other than the small forces required to support the weight of the hand and to overcome inertia and air-resistance. If, however, someone else takes the hand as in a handclasp and holds it firmly while pronation and supination are attempted, stresses now occur, and can be perceived, in the radius and ulna: if there were a fracture this might easily be displaced. Anyone who has a long plaster case applied to his own arm can feel the firm hold it has on his hand, preventing it from rotating, and he can feel the strain in his own bones when he attempts to pronate or supinate against the unyielding resistance. In each case the strains cease as soon as either he ceases contracting his muscles or the resistance ceases—that is, when the handclasp is relaxed or the plaster case is removed. The stresses that then remain are once again only those due to gravity.

In the lower limb, from a knowledge of the direction of the talo-calcaneonavicular axis (Hicks 1953) it can be deduced that attempts to invert and evert the foot against resistance will tend to cause the lower fragment of a fractured tibia to rotate externally and internally respectively upon the upper fragment. To prove this experimentally the actions of peroneus brevis and tibialis posterior were simulated in another amputation specimen which had been enclosed in a case.

Three windows were cut in the plaster—one over the fracture site and one each over the tendons concerned. Two Kirschner wires were driven by their points into the bone—one just above the fracture and one below—and arranged to lie parallel with each other and fairly close together so that small degrees of movement of one fragment relative to the other would be rendered obvious. Loops of the two tendons were hooked out over an arrangement of pulleys that ensured equal pulls distally upon the origin and proximally upon the insertion, in imitation of normal muscle action. When tension was applied to one or other of the tendons the lower fragment of the tibia was observed to rotate as expected and in the direction predicted by theory. By alternately pulling on the two tendons as much as 12° of rotation was obtained at the fracture site. In this movement the distal fragment is the active and the proximal the passive participant. The power comes from the invertor/evertor muscles acting on the foot, and the drive is transmitted thence proximally through the talo-calcaneonavicular joint in much the same way as torque is conveyed along the transmission system of a car through the universal couplings. The relative movement between the two fragments would have been even greater than 12° but for the fact that the passive upper fragment followed the movements of the lower one to some extent. Thus, if the plaster case had really done what it is popularly believed to do—that is, taken a firm hold upon the proximal fragment—the amount of movement of the lower fragment relative to the upper would have been even greater. When the foot portion of the case was removed—that is, when the resistance to foot movement ceased—the effect disappeared.

Thus the forces generated by the muscles, instead of being exteriorised as movements of the limb, are so to speak turned inwards and act with equal but opposite effect upon the fracture site. The more effective the plaster at resisting pronation-supination in the hand or inversion-eversion in the foot, the more effectively are the muscle forces inturned. This feature is not, of course, confined to the forearm and leg, although these happen to be particularly susceptible sites. Wherever in the body external splintage provides resistance to the free movement of a joint, muscles can cause movement at an adjacent fracture. This is an example of a more general rule: when a muscle acts, if it cannot cause movement of the joint it will tend to cause movement at the fracture site. If the plaster cases in the above examples had not extended beyond the wrist or the ankle or above the elbow or knee, the muscles would not have tended to cause movement. Thus, contrary to popular belief, long plaster cases that interfere with movements of the joint above or the joint below provide the opportunity for muscles to cause movement at the fracture site, and the patient only has to exercise these muscles for the movement to occur. As regards the magnitude of the forces, without splintage the deforming force can be no larger than is consistent with the weight of the limb (fig. 3), whereas with splintage the forces may be of any magnitude, being limited only by the strength of the participants and of the plaster case (figs. 4 and 5): it is not beyond the bounds of possibility that the movements so caused may affect the process of union.

Some doubt may remain as to whether the conditions obtaining in the above experiments ever arise in real life, especially as contracting muscle bellies are popularly supposed (though never proved) to have some supportive action on a fracture. Another experiment was therefore carried out, this time upon a patient who had delayed union of a fractured ulna, certain characteristics of which aroused the suspicion that it was due to persistent movement at the fracture site.

This fracture had been treated orthodoxly by a plaster case extending from the necks of the metacarpals to the upper third of the arm so that, according to popular teaching, proper fixation had been provided, whereas, according to this new theory, suitable conditions for the creation of movement had been present. An operation being necessary, with the patient under an anæsthetic electrodes were bandaged over the forearm muscles and a well-moulded long plaster case was reapplied. Through a window Kirschner wires were driven into the ulna, one above and one below the fracture site, to act as pointers. Faradic current was then switched on and off to make the muscles contract. The pointers revealed, each time this was done, that movement occurred at the fracture site. One result of this experiment was a decision to carry out real "fixation", whereupon the fracture united without any graft being necessary. (This is to be described more fully in a subsequent paper.)

Surgeon and physiotherapist, with their modern enthusiasm for early "exercises", encourage the very muscle contractions that can cause movement of a fracture in plaster. The patient referred to above had not been told to avoid exercise in the early weeks of treatment, and he remembered noticing pain in the region of the fracture when he had tried to twist his arm inside the plaster.

The amplitude of movement in this instance was seen to be about 2–3°, and this probably represents the usual order of magnitude of these movements. This suggests that they may be common, but undetected because of our inexact methods of clinical and radiological examination. Each time a limb is X-rayed it is placed in approximately the same position so that the fragments are likely always to settle into the same position, even though they may have been moving relative to each other in the intervening periods. The fact that we do not ordinarily see movement therefore is certainly no proof that it does not occur.

High-power Low-amplitude Movement

Two or three degrees of movement might seem to be unimportant, easily stopped, and unlikely to have any harmful effect on a fracture. Not only the amplitude, however, but the power with which a movement takes

place must be considered. Movement can be of low power or of high power, and it is a mistake to think of high-power movement as necessarily of large amplitude. For example, a train going over a bridge bends the bridge. The bend is only a fraction of a degree, but the power behind the movement is, in terms of human endeavour, irresistible. Similarly the movement at the fracture site, although small, can be of high power. It is the fact that, in the circumstances described, this movement is " power-driven ", brought about by muscles used to contracting with forces of fifty or a hundred pounds, that gives some cause for concern. This should be kept in mind as a possible explanation for the misbehaviour of certain fractures in practice.

Discussion

No question is being raised as to the positive action of external splintage against forces from outside—for example, gravity or accidental blows. Against these, the larger and better fitting the splint, the greater is the fixation. It is against forces coming from within that a splint's effect is inverted. These latter forces scarcely act at all on the fracture in the absence of external splintage, but they do so in increasing degree as joints proximally or distally are included.

It is not intended to imply that all fractures treated in long plasters are inevitably and continuously subjected to movement. Firstly, almost all plasters at some time become loose or soft, or break, or they are applied for only a short distance beyond the adjacent joint. When the external splintage fails to limit the movement of the joint above or the joint below, movement at the fracture site due to muscle action does *not* occur. Thus, paradoxically, plasters that are too short, too loose, or otherwise badly applied (by present criteria) may result in less imposed movement at the fracture site than those that are " correct ". In addition, if the patient does not contract his muscles there will be no forces to be inturned. Thus by avoiding exercises both voluntarily and reflexly, and by obeying the dictates of pain to let the limb lie completely still, the patient himself may succeed in avoiding movement at the fracture site. It is probably in these indirect ways that present treatment succeeds—when it does succeed—rather than by any direct splintage effect.

The imposed movement described here is always of low amplitude, and one might be excused for dismissing it as unimportant were it not that some fractures still unaccountably do badly, particularly as regards non-union and joint stiffness. The suggestion that joint stiffness is caused by movement at the fracture site has already been made (Hicks 1959). It now seems possible that the " invisible " movement described in the present paper may be the factor responsible for the stiffness consequent on plaster treatment—in other words, that the stiffness is being caused not so much by the immobilisation of the joint as by the failure of immobilisation of the fracture.

Summary

External splintage is effective only in so far as it prevents gross movement at a fracture site. It is very ineffective at preventing small movements. Whole-diameter shift, 20° of rotation, or 5–10° of angulation, can certainly occur inside a conventional plaster case; and evidence suggests that such movements do occur.

External splintage plus muscle contraction tend to *cause* movement at a fracture site. Many of the rules of splintage (e.g., having the plaster full-length and well-fitting, and extending it beyond the joint above and the joint below) increase the likelihood of this movement. Muscle " exercises " are the motive power of the movement.

REFERENCES

Charnley, J. (1950) The Closed Treatment of Common Fractures Edinburgh.
Evans, E. M. (1951) *J. Bone Jt Surg.* **33B**, 548.
Hicks, J. H. (1953) *J. Anat., Lond.* **87**, 345.
— (1959) *in* Modern Trends in Accident Surgery and Medicine. London.

ENVIRONMENTAL STAPHYLOCOCCAL CONTAMINATION

A STUDY BY A NEW METHOD

W. D. FOSTER
M.D. Cantab.
LECTURER IN PATHOLOGY,
LOUIS JENNER LABORATORY, ST. THOMAS'S HOSPITAL, LONDON, S.E.1

ALTHOUGH some outbreaks of staphylococcal infection of clean operation wounds have been shown to be due to organisms from nasal carriers (Sornpolinsky et al. 1957, Pennikett et al. 1958) or from members of an operating team with superficial sepsis (McDonald and Timbury 1957, Mitchell et al. 1959), in many outbreaks no particular source has been identified. Autoinfection may be responsible in some cases, the organisms having come from the patient's carrier sites in the nose or perineum, but often the organisms have been transferred from neighbouring infected patients either directly by way of the hands, &c., or indirectly by airborne particles from dressings, bedding, or floor dust.

This paper is concerned with possible means of cross-infection from other patients. Hitherto, it has been hard to say how much environmental contamination occurs. Use of the slit-sampler means that only airborne particles can be sampled; and it is well known that the number of organisms found varies greatly from hour to hour, depending largely on such activities as bedmaking and ward sweeping. Settling-plates suffer from the same disadvantages, with the additional risks involved in their having to be exposed for at least half an hour—not only disrupting ward routine but possibly being broken. With the impinger methods of floor-dust sampling, such as that described by Williams (1949), it is impossible to estimate how much of the dust is actually sampled, or to obtain figures for an area of given size. Gentles (1956) described a direct floor-sampling method, but its use for taking a large number of samples would be laborious.

For these reasons I have devised a new method. By applying slabs of agar (reinforced with gauze) to the floor or other surfaces, one can estimate the number and type of organisms on a unit area. By use of these " impression plates " it has been possible not only to assess the degree of environmental contamination in wards but also to evolve methods for its reduction.

Methods

Media.—For isolation of *Staphylococcus aureus* from wounds and skin, blood-agar plates were employed, and for the impression plates usually plain nutrient agar. The plates were incubated overnight at 37°C and then left on the bench for a further 24 hours. Colonies of *Staph. aureus* were recognised by their colonial appearances and confirmed by the slide coagulase test.

Surface sampling and counting.—The impression plates were prepared by laying a strip of sterile bandage $1^1/_2$ in. wide, right across an empty petri dish and pouring agar over it. With such a stiffening, it is possible, with forceps, to remove the disc of medium from the petri dish, press its undersurface

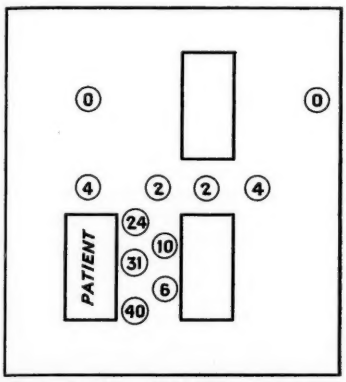


Fig. 1—Numbers of *Staph. aureus* per impression plate in different positions in a ward containing a case of impetigo.

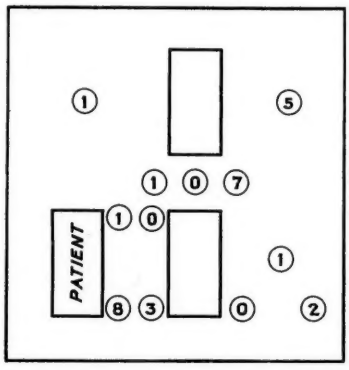


Fig. 2—Distribution of *Staph. aureus* in the ward 2 days after the discharge of the case of impetigo.

evenly on the floor, pick it up, and return it (contaminated surface uppermost) to the *lid* of the petri dish. After incubation the number of colonies of staphylococci developing can be counted. Although all the organisms from the area sampled are not picked up, counts of the total number of all organisms on different occasions showed that the method gave fairly reproducible results.

Results

Contamination of Environment by Individual Patients

To determine how heavily the environment can become contaminated by coagulase-positive staphylococci, a small three-bed ward which had just been fumigated was studied.

TABLE I—NUMBER OF STAPHYLOCOCCI PER PLATE AT DIFFERENT DISTANCES FROM BED

—	1 ft.	2 ft.	3 ft.	5 ft.
1	39	37	13	0
2	33	18	14	7
3	23	0	6	0
4	11	18	24	4
5	0	21	6	19
6	33	0	6	0
7	25	0	10	16
8	28	34	0	6

A patient with a small patch of impetigo was admitted, and *Staph. aureus* (types 71 and 3c) and group-A streptococci were isolated from the lesion. About 24 hours after admission, blood-agar settling-plates which were exposed for 30 minutes at various positions around the bed grew an average of 3·0 colonies of *Staph. aureus* and 0·5 colonies of *Streptococcus pyogenes* per plate. At the same time impression plates using blood-agar containing the strip of bandage were taken at different positions in the ward. Fig. 1 shows the distribution of the plates and the numbers of *Staph. aureus* picked up by each. No streptococci were picked up from the floor, but phage typing confirmed that most of the staphylococci on the floor had in fact come from the patient.

The patient remained in the ward for 4 days and was then discharged because the lesion had healed. 2 days later, before another patient was admitted, another set of impression plates was made from the floor. These showed that all the organisms of the patient's phage type had either died or been removed by the ward routine cleaning which did not include any antiseptic methods (fig. 2).

If, as the above experiment suggests, a patient with comparatively small lesions can heavily contaminate his environment, contamination by a patient with a severe infection may be even greater. This was clearly demonstrated in the case of a patient with a staphylococcal lung abscess:

Impression plates were taken from the floor, in four zones 1 ft., 2 ft., 3 ft., and 5 ft. from the edge of the bed. Representative colonies from the patient's sputum and each zone on the floor were all members of phage type 54 (table I).

Use of the Method to Investigate Cross-infection

The impression plate method was used in the study of a small outbreak of wound sepsis in a ward.

A male general surgical ward had been cleaned and fumigated. After it was reopened, two patients (one with infection of an amputation wound and the other with a postprostatectomy urinary infection, both caused by *Staph. aureus* type 77) were admitted. 7 days later a third patient, whose laminectomy wound was known to have been free of *Staph. aureus*, had the wound probed in the ward, and 2 days after that the wound was found to be also infected by a type-77 strain. The nose of the sister who probed the wound was free of *Staph. aureus*. In the next 3 months there were four more cases of infection with this type of staphylococcus, as well as several infections with other strains.

From time to time an impression plate was taken between each bed, and table II shows the average number of staphylococcal colonies per plate. From fig. 3, which shows the numbers and distribution of *Staph. aureus* on one particular day, it will be seen that the highest counts were obtained in the neighbourhood of infected patients.

Use of the Method to Investigate the Effect of Ward-cleaning

Although the floor was probably being continually re-contaminated by *Staph. aureus* from the infected wounds, it seemed worth ascertaining whether more stringent ward-cleaning would lessen the contamination.

The routine method employed was to wash the linoleum squares of the ward floor with a detergent once a week and swab them daily with 'Sudol' solutions. Although the dilution of sudol prescribed by the manufacturers was 1/120, the strength recommended for the ward was 1/80; but in practice this was achieved only approximately. Impression plates taken before and after washing the floor with detergent showed a reduction from 56 *Staph. aureus* per area to 14, and swabbing with sudol by the wardmaid reduced it from 114 to 59. In view

TABLE II

Date	Average number staph. per plate
Aug. 21	13
„ 27	13
Sept. 4	10
„ 11	18
„ 23	26
Oct. 8	16
„ 16	0 (a)
„ 18	3
„ 21	1·5
„ 27	28 (b)
Nov. 4	16
„ 11	7·5
„ 21	10
„ 26	11
Dec. 9	7
„ 16	7
„ 31	6
Feb. 2	0 (c)
„ 16	0·5
March 2	0
„ 23	0·3
April 15	1·5
May 7	4·3
„ 20	0·5

(a) New cleaning routine, 1/40 'Sudol' to floors.
(b) Reversion to old cleaning routine, water only to floors.
(c) Anti-staphylococcus campaign.

of the number of staphylococci surviving this treatment, experiments were undertaken in which an area of laboratory floor was contaminated with a broth culture of *Staph. aureus* and when dry was wiped with cotton-wool soaked in sudol of different strengths. Impression plates taken afterwards showed that not until a strength of 1/40 was used was killing effective.

Table II shows the results obtained when 1/40 sudol was used in the ward. The number of *Staph. aureus* fell considerably.

After 10 days the use of sudol was stopped, and impression plates taken 2 days later showed the staphylococci to be as numerous as before. It was thus clear that strict attention to ward-cleaning may in itself reduce contamination dramatically.

Subsequent History of the Ward Investigation

Fig. 4 shows that after reversion to the old ward-cleaning routine the epidemic of wound sepsis ended spontaneously and the number of staphylococci on the floor considerably diminished though they did not disappear.

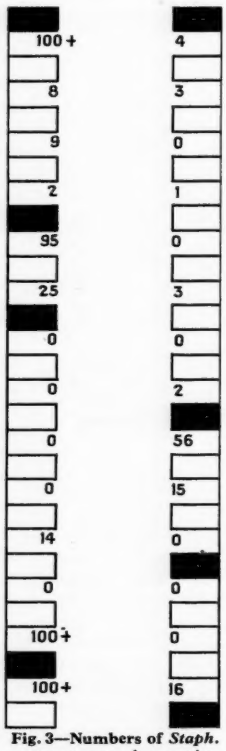


Fig. 3—Numbers of *Staph. aureus* per impression plate between each bed in a surgical ward. Beds containing staphylococcus-infected patients in black.

At the end of December, 1958, after a severe case of staphylococcal sepsis, an intensive campaign against wound sepsis was started. The measures adopted included the use of 1/40 sudol for mopping the floor daily, wet dusting of the furniture using rags wrung out in 1/2000 chlorhexidine ('Hibitane'), and meticulous nursing techniques—which did not, however, include full isolation precautions—for infected cases. Cultures were taken which showed that staphylococci almost disappeared from the floor for the next 12 weeks and during this time there was only one further case of infection.

When, towards the end of April, 1959, three cases of wound infection occurred, investigation showed that the number of *Staph. aureus* on the floor had again risen.

Discussion

From experiments in which dressings from wounds were exposed to the air, Willetts and Hare (1941) showed that large numbers of infected particles were discharged into the air. Bourdillon and Colebrook (1946) extended these observations to air sampling in dressing-rooms and demonstrated that it is virtually impossible to remove dressings from an infected wound without causing airborne contamination. That the air in the neighbourhood of staphylococcal carriers can be similarly contaminated during movement and other forms of agitation is illustrated by the work of Hare and Thomas (1956) and Hare and Ridley (1958).

It has always been presumed that the infected particles released into the air by these various means fall very quickly on to the floor and bedding and elsewhere, and that they are likely to remain there until the surfaces are disturbed in one way or another. But this scatter has not hitherto been assessed quantitatively, and the impression-plate method goes some way to remedy this deficiency.

There has been no clear evidence that *Staph. aureus* infections can be airborne (Shooter et al. 1958), and, even if they can, the importance of this compared with other modes of spread has not been determined. One difficulty is the apparent discrepancy between the large dose of staphylococci required to produce a lesion experimentally (Elek 1956) and the small number of staphylococcus-carrying particles in the air samples. The large number of organisms found in the present study on the floor near infected patients, where they may easily be rendered airborne by bedside activity before changing dressings, goes some way to resolving this inconsistency. Certainly the infection of our patient who had a laminectomy wound can be explained only by airborne spread from his infected neighbour, since the sister who probed his wound was not herself a carrier.

If environmental staphylococci are of some significance in cross-infection, it seems important that effective measures should be employed to keep their numbers to a minimum.

Duthie (1957) found epidemic staphylococci in hospital dust and noted that when special ward-cleaning measures were introduced the bacterial population was reduced; this was followed by a reduction in wound infections. Similarly, Barber and Dutton (1958) found *Staph. aureus* in the ward environment at the time of an epidemic and were able to get rid of it by cleaning. In contrast, Timbury et al. (1958) were surprised that they could not find type 80 *Staph. aureus* in a ward which had had to be closed because of epidemic infection. This may have been because the ward samples were taken after the patients had been removed from the ward; for our experiment with the case of impetigo showed that, without any special cleaning process, his type of staphylococci had disappeared from the ward within 2 days of his discharge.

The present study emphasises the value of disinfectants. The ward-cleaning routine was not effective at first; yet, with comparatively minor adjustments, such as using a disinfectant of adequate strength and wet dusting instead of dry dusting, environmental staphylococci were reduced. The experiments to determine the concentration of sudol necessary to disinfect the floor showed that it is probably unwise to be guided entirely by manufacturers' recommendations. Methods of testing disinfectants in the pharmaceutical laboratory are necessarily artificial and allow enough time for the disinfectant to act on the test organism. In the ward the time of contact may be much shorter, and the recommended concentration may thus be ineffective.

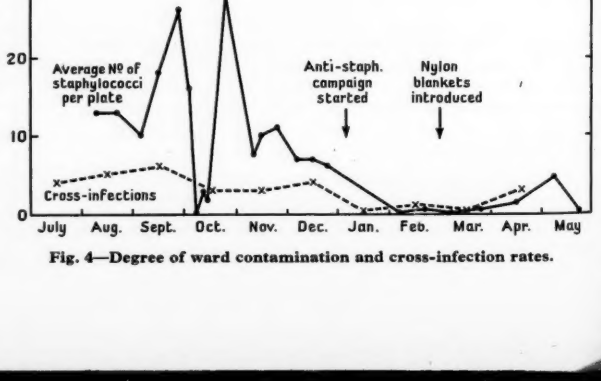


Fig. 4—Degree of ward contamination and cross-infection rates.

The relation between the number of environmental staphylococci and the cross-infection rate has not yet been clearly established.

Shooter et al. (1957) found that a high proportion of the *Staph. aureus* isolated from the ward air belonged to the type causing an epidemic of wound sepsis, and suggested that the risk of an epidemic might be estimated from the number of *Staph. aureus* in the air. However, in a later paper (1958) they found that in a long study of staphylococci in a surgical ward several waves of colonisation of the ward with different strains of *Staph. aureus* took place, and that these were not necessarily related to the incidence of sepsis.

The present investigation has not continued long enough for clear-cut conclusions about this; but it provides some evidence of an inverse relation between the cross-infection rate and the number of staphylococci in the environment. Counts of staphylococci, if combined with phage-typing of a random sample, might show when any strain—particularly one known to have caused an infection—was attaining dangerous proportions. In the outbreak described, four out of five cases of type 77 cross-infections occurred at a time when type 77 constituted over three-quarters of the strains found on the floor. The present study also indicates that one of the most important measures to combat cross-infection might be that changes of wound dressings should be confined to the period of reduced numbers of staphylococci in the ward.

Summary

A new method of assessing environmental contamination by staphylococci is described, and an account is given of its use in investigating an outbreak of staphylococcal wound sepsis and in devising effective measures for disinfecting wards.

I am greatly indebted to Dr. J. L. Pinniger and Prof. R. Hare for their help in the preparation of this paper, and to Dr. R. E. O. Williams for the phage-typing of staphylococci.

REFERENCES

Barber, H., Dutton, A. A. C. (1958) *Lancet* ii, 65.
Bourdillon, R. B., Colebrook, L. (1946) *ibid.* i, 561.
Duthie, E. S. (1957) Association of Clinical Pathologists, Symposium on Hospital Coccal Infections.
Elek, S. D. (1956) *Ann. N.Y. Acad. Sci.* **65**, 85.
Gentles, J. C. (1956) *J. clin. Path.* **9**, 374.
Hare, R., Ridley, M. (1958) *Brit. med. J.* i, 69.
— Thomas, C. G. T. (1956) *ibid.* ii, 840.
McDonald, S., Timbury, M. C. (1957) *Lancet*, i, 863.
Mitchell, A. A. B., Timbury, M. C., Pettigrew, J. B., Hutchinson, J. G. P. (1959) *ibid*, ii, 503.
Pennikett, E. J. K., Knox, R., Liddel, J. (1958) *Brit. med. J.* i, 812.
Shooter, R. A., Griffiths, J. D., Williams, R. E. O. (1957) *ibid.* i, 433.
— Smith, M. A., Griffiths, J. D., Brown, M. E., Williams, R. E. O., Rippon, J. E., Jevons, M. P. (1958) *ibid.* i, 607.
Sornpolinsky, D., Hermann, Z., Oeding, P., Rippon, J. E. (1957) *J. infect. Dis.* **100**, 1.
Timbury, R. C., Wilson, T. S., Hutchinson, J. G. P., Govan, A. D. T. (1958) *Lancet*, ii, 1081.
Willetts, R. E., Hare, R. (1941) *Canad. med. Ass. J.* **45**, 479.
Williams, R. E. O. (1949) *J. Hyg., Camb.* **47**, 416.

"... The welfare state has brought into existence procedures by which the natural rights of parents over their children can be encroached upon out of the highest motives. Those of us who are magistrates are constantly under the temptation to assume that we know better than deviant parents and others how their children should be looked after; and social workers, too, are inclined to assume that their institutional homes are better than the apparently dreary and unattractive homes of difficult parents. The powers we possess are excellent in themselves, but their abuse can lead to a new and subtle form of tyranny over an awkward minority. This is most likely to happen where magistrates are keen and knowledgeable in their work and where social workers are efficient in interpreting the statutes and wishes of local authorities. Thus efficiency can be its own danger in this particular field."—Mr. RICHARD O'BRIEN, *The Times*, March 21, 1960, p. 13.

REGIONAL PERFUSION WITH CYTOTOXIC AGENTS

D. B. LONGMORE
M.B. Lond., F.R.C.S.E.
RESEARCH FELLOW, DEPARTMENT OF THORACIC SURGERY, MIDDLESEX HOSPITAL, LONDON, W.1

CYTOTOXIC drugs, given in quantities large enough to destroy a carcinoma and allowed to get into the general circulation, may be lethal. Creech (1958) and Stehlin (1958) have suggested regional perfusion as a method of delivering cytotoxic drugs in a concentration high enough to be tumourcidal, without exposing unnecessary amounts of physiologically dividing normal tissues to the drug.

In this small series an attempt has been made to evaluate regional perfusion as a method of treating brain tumours and limb tumours.

Two drugs were used: nitrogen mustard and malphalan ester hydrochloride. By careful isolation of the part it was possible to eliminate leakage into the general circulation. The region chosen for perfusion was widened in some cases in order to include the regional lymphatic drainage. The perfusions were carried out at 43°C (108°F). Tumour metabolism was "stepped up" by the administration of triiodothyronine for the preceding few days. A high oxygen tension was maintained in the perfused parts. Histamine was used to increase the capillary permeability.

In all cases gravity venous drainage was sufficient. A 'Sigmamotor' pump was used to supply arterial pressure. A Coolie-type stainless-steel oxygenator incorporating a heat exchanger was used. It was modified to reduce its priming volume to under three pints. Blood was drawn within a few days of perfusion into siliconised bottles containing 25 mg. of heparin in 30 ml. physiological dextrose-saline solution. Patients were heparinised using 2 mg. per kg. body-weight immediately before cannulation. 'Polybrene' has been used throughout to neutralise the heparin in a dose ratio of 1·5 : 1 polybrene : heparin.

Technique of Brain Perfusion

Preliminary procedures were undertaken in two patients in order to establish the feasibility of total brain perfusion. In these patients the carotid bifurcations, the vertebral arteries, and the internal jugular veins were exposed.

The internal jugular veins were cannulated with 'Tygon' tubing with a calibre half that of the vein. These cannulæ were arranged in such manner that the venous return from the head might be diverted at will into measuring cylinders. Needle Geiger counters were placed in the tips of these cannulæ. The internal carotid arteries were needled and injections of radio-isotope were made into each in turn. Thus it was possible to record the arrival and clearance times of the injected isotope at the internal jugular veins. This was repeated for injections of various durations. The vertebral arteries were needled and the vertebral veins compressed. Injections of radio-isotope of various durations were made into each vertebral artery in turn. The arrival and clearance times of the isotopes at the internal jugular veins were again recorded by the Geiger counters. The arrival-times for injections into all four vessels were 8 seconds on the ipsilateral side and 10 seconds on the contralateral side. Clearance-times were less clearly marked. Most radioactivity was gone from the internal jugular veins after 1 minute. 10 mg. batches of hot freshly prepared nitrogen mustard were then injected simultaneously into the internal carotid and vertebral arteries through the needles, which were left in situ from the injections of radio-isotope. During the time when the drug could be expected to be draining through the internal jugular veins, the venous

return from the head was discarded into measuring cylinders. At the same time the measured loss was replaced by transfusion. After the patient's blood-pressure had stabilised the injections were repeated.

By this technique it was possible to give 80 mg. of nitrogen mustard to the brain without leakage into the general circulation. The main theoretical disadvantage of this technique was that perhaps the cytotoxic drug was not present in the brain for sufficient time to destroy the tumour. Accordingly it was decided to connect the cerebral circulation to a heart-lung machine and perfuse with the cytotoxic drugs for a longer period.

Both carotid bifurcations and internal jugular veins were exposed. The internal jugular veins were cannulated and the cannulæ were connected through a Y tube to the venous side of the heart-lung machine. The external carotid arteries were cannulated with 5 mm. internal-diameter arterial cannulæ pointing downwards. These cannulæ were connected by a Y tube to the arterial side of the heart-lung machine. Great care was taken to exclude air from the arterial lines and connectors, to prevent embolism. The vertebral veins were occluded. The heart-lung machine was started, thus establishing partial perfusion of the cerebral circulation.

Total perfusion was obtained by drawing tight tapes on the outside of the internal jugular veins around the cannulæ; at the same time the common carotid arteries were occluded. By pumping up the operating-table to increase the suction by gravity on the internal jugular veins and increasing the output of the arterial pump, very satisfactory perfusion was obtained. At all times the pressure in the carotid bifurcations was kept 10 mm. below the systemic pressure in order to prevent leakage of drug into the vertebral arterial system. As a result of this pressure differential the patient bled into the reservoir of the oxygenator, and a corresponding amount had to be transfused. The brain was kept at normal temperature, and 30 mg. of malphalan ester hydrochloride was added to the blood in the machine. Within a few minutes there was œdema of the eyeballs. 50 ml. of 50% sucrose added to the extracorporeal circulation caused this to subside. The perfusion was continued for 40 minutes. The brain was then washed out with fresh blood. The clamps were removed from the common carotid arteries and the venous snares released. Thus the continuity of the cerebral circulation was restored. The internal jugular veins were repaired after withdrawal of the cannulæ. The external carotid arteries were repaired at leisure between clamps.

Technique of Leg Perfusion

The legs were towelled in transparent plastic sheeting in order that changes in skin colour might be observed. A nail was then driven into the greater trochanter of the femur. A stout rubber tourniquet was placed around the thigh above the nail in such a manner as to leave unhampered access to the groin. The femoral vessels were then exposed and cannulated. It was usually possible to insert a 1 cm. venous cannula into the femoral vein and a 5 mm. internal-diameter arterial cannula into the common femoral artery. These cannulæ were then connected to the heart-lung machine. After careful aspiration of all air from the arterial line the perfusion was started. The tourniquet around the thigh was now tightened. Radio-isotope was now added to the extracorporeal circuit, and samples of venous blood from the arm were scanned with a Geiger counter to make certain that there was no leak from the leg into the general circulation. While this check was taking place the limb was warmed to 43°C, using the heat exchanger. Venous return was increased until the venous blood was well oxygenated, simply by increasing the arterial flow from the oxygenator to the limb. The malphalan was then added to the arterial reservoir of the oxygenator. After perfusion for 1 hour the venous blood was discharged and the leg refilled with fresh blood. The cannulæ were then withdrawn, the vessels were repaired, and the tourniquet and nail were removed. Postoperatively the leg was elevated to reduce œdema.

Technique of Arm Perfusion

A proximal tourniquet was placed as high as possible round the arm to isolate it. A distal tourniquet was placed round the wrist to exclude the hand. The arterial cannula was inserted into the radial artery at the wrist, pointing proximally The brachial venæ comitantes in the upper arm were cannulated through a second small incision. The arm was perfused in a retrograde manner. Perfusion and flushing out were done as for the leg. No attempt was made to repair the radial artery.

Case-reports

Case 1: *leg perfusion.*—In February, 1959, a 65-year-old woman with a malignant melanoma of the right leg was treated. The leg was covered with nodules extending to the upper thigh from a primary on the ankle. 40 mg. of malphalan ester hydrochloride was used. There was slight postoperative œdema but no pain. There has been no obvious change in the tumour.

Case 2: *brain perfusion.*—In June, 1959, a 37-year-old woman with left-sided cerebral metastases was treated. Her right leg had been amputated on account of malignant melanoma, and brain biopsy revealed a similar tumour. 30 mg. of nitrogen mustard was used. A postoperative tracheostomy was done. There was some cerebral œdema for 48 hours, but no significant change in her condition, and she died in the 4th week.

Case 3: *brain perfusion.*—In July, 1959, a 55-year-old man with bilateral cerebral and cerebellar metastases from a carcinoma of the bronchus was treated. 80 mg. of nitrogen mustard was used in the vertebral and carotid system. Postoperatively he had cerebral œdema, which responded to intravenous sucrose and urea. His general condition was made worse by the perfusion. He required bronchoscopy and tracheostomy before he died after 6 weeks of bronchopneumonia.

Case 4: *brain perfusion.*—In September, 1959, a 50-year-old man with evidence of cerebral metastases after pneumonectomy for carcinoma of the bronchus was treated. The cerebral circulation was perfused for 1 hour using 40 mg. of malphalan ester hydrochloride. A tracheostomy was done. Postoperatively he regained consciousness but was agitated and confused. He died suddenly at 5 hours of a massive cerebellar hæmorrhage into an unsuspected deposit.

Case 5: *leg perfusion.*—In November, 1959, a 37-year-old woman with fibrosarcoma of the knee was treated. This knee had been arthrodesed on account of tuberculosis many years before. A new swelling developed 17 months ago and was incised. This had fungated. Secondary nodules had appeared round it. By the time the patient came for biopsy the inguinal and internal iliac glands were involved with fibrosarcoma. It was decided to perfuse the limb and irradiate the iliac fossa. Just as perfusion was started she had cardiac arrest requiring cardiac massage. She was perfused with 70 mg. of malphalan ester hydrochloride for 1 hour. Postoperatively, following thoracotomy while heparinised, the patient had a hæmothorax requiring aspiration. Patches of full-thickness skin loss on the leg later developed owing to overdosage of the drug. She is now jaundiced and going downhill.

Case 6: *arm perfusion.*—In December, 1959, a 63-year-old woman, who was obese, fell at home and sustained a fracture of the left humerus. Owing to the gross obesity internal fixation was required, and eventually open reduction was necessary. An unusual appearance of the fracture site prompted biopsy, which revealed osteogenic sarcoma. 3 weeks later the arm was perfused with 30 mg. of malphalan ester hydrochloride. Postoperatively the patient was not disturbed. There is no evidence of union.

HISTOLOGICAL EVIDENCE OF FAILURE

Case 1 had preoperative biopsy, operative biopsy, and serial postoperative biopsies. There was no detectable change in the microscopic appearances of the tumour.

Case 2 had preoperative biopsy, and at necropsy liver metastases were also sectioned. The microscopic appearances

SUMMARY OF RESULTS

Case no.	Region	Tumour	Result	Histology
1	Leg	Malignant melanoma	No change in tumour over 1 yr.	No change
2	Cerebrum	Malignant melanoma	Died in 4th week	No change
3	Cerebrum and cerebellum	Carcinoma of bronchus	Died in 7th week	No change
4	Cerebrum and cerebellum	Carcinoma of bronchus	Died in 5 hours	No change
5	Leg	Fibrosarcoma	Patchy gangrene due to overdose	No change
6	Arm	Osteogenic sarcoma	Non-union	Not done

of the perfused brain tumour were unchanged when compared with the liver deposits and the preoperative biopsy.

Case 3 had a bronchoscopic biopsy of the carcinoma of the lung. Necropsy specimens showed no loss of viability of either the cerebral or the cerebellar tumour deposits.

In *case 4* a specimen from the previous pneumonectomy was available. There were cerebellar deposits which were not perfused to compare with the perfused cerebral metastases. There was no detectable difference between the perfused and untreated tumours.

Case 5 had preoperative, operative, and postoperative serial biopsies. There was no change in microscopic appearances throughout.

Case 6 has not yet had post-perfusion biopsy done.

The results are summarised in the accompanying table.

Discussion

The work of Stehlin (1958) and Creech (1958) has shown that malphalan ester hydrochloride and similar alkylating agents do not necessarily destroy tumours in limbs. Accordingly an attempt was made to enhance the activity of the drugs used, by several methods.

Both the drugs used are alkylating agents, and act by chemical combination. Thus it is reasonable to suppose that physical laws apply. Since a 10°C rise in temperature approximately doubles the rate of a chemical reaction it was felt that perfusion at 43°C represented a satisfactory compromise between tissue damage due to over-heating and the desired acceleration of combination. The heat exchanger of the machine was set at this temperature for perfusion.

Histamine was added to the blood in the heart-lung machine to increase capillary permeability in order to allow greater diffusion of the drug into the tissues.

These drugs are believed to act on the early stages of mitosis. Therefore triiodothyronine was given to all the patients in this series for 3 days preoperatively in order to increase the incidence of mitosis.

These drugs are to some extent radiomimetic. Since irradiation is more effective in the presence of a high oxygen tension, it was thought that cytotoxic drugs might act similarly. In all these perfusions the arterial input to the part was increased until the venous oxygen saturation was over 80%, thus ensuring a high oxygen tension in the tissues concerned.

Malphalan ester hydrochloride was used for all the perfusions except the preliminary brain experiments, for which nitrogen mustard was used because it has a shorter half-life, so that any residual drug which might have escaped into the general circulation would be less harmful.

The dosage of malphalan was based on previous experience with the drug. The high dosage used was aimed at approaching the maximum which normal tissues would stand. 30 mg. of malphalan ester hydrochloride in a brain perfusion caused cerebral œdema requiring intravenous sucrose. 70 mg. of the same drug caused patchy skin loss in a large leg. This represents an overdose.

The techniques of cannulation and running the heart-lung machine for regional perfusions are simple, though tedious. Precautions have to be taken to avoid the possible complications of extracorporeal circulation, such as air or clot embolism, hæmorrhage due to heparin, pH change, temperature change, and narrowing or leakage of the vessels at the site of closure.

It was found in this series that even using high concentrations of drug, and attempting to increase its efficacy, the histological appearances of the tumours treated were unchanged. This was so even when normal tissue tolerance was exceeded.

These results are naturally disappointing, but the history of the cytotoxic drugs is still young. The techniques are established for the perfusion of limb and brain tumours. When more suitable drugs are available, perfusion may represent a good method of administration. Meanwhile the complications of perfusion may outweigh the palliation obtained. At present, with the drugs available, perfusion may increase suffering, or even shorten life.

Summary

Regional perfusion with nitrogen mustard or malphalan ester hydrochloride was applied in three cases of malignant neoplasm of a limb and three cases of cerebral neoplasm.

No histological or other evidence of improvement was observed.

The complications of perfusion with existing cytotoxic agents may outweigh its usefulness in the palliation of malignant conditions.

I wish to thank Mr. T. Holmes Sellors, Mr. J. R. Belcher, and Dr. J. W. Stewart for their help and support in this work; and Mr. Belcher, Dr. M. Kremer, Mr. V. Logue, Mr. C. J. B. Murray, Dr. A. Jelliffe, Mr. B. Madden, and Mr. P. Wiles, of the Middlesex Hospital, and Dr. O. R. Garai, of the Royal Marsden Hospital, for providing patients.

REFERENCES

Creech, O. (1958) *Ann. Surg.* **148**, 616.
Stehlin, J. (1958) Personal communication.
Stock, J. (1958) Personal communication.

BLOOD-PRESSURES AFTER NEPHRECTOMY AND PARTIAL NEPHRECTOMY FOR CALCULOUS DISEASE

W. J. PRYN
M.B. Lond., F.R.C.S.
MAJOR R.A.M.C.; SURGICAL REGISTRAR, HAMMERSMITH HOSPITAL
From the Department of Surgery, Postgraduate Medical School of London, W.12

BY modern investigations, including divided renal function studies (Graber and Shackman 1956, Howard et al. 1957, Schlegel et al. 1959), aortography (Poutasse 1956, Poutasse et al. 1956, Hodson 1957, Maluf 1958, Gregg 1958, Poutasse and Dunston 1958), and radioactive-diodrast renograms (Winter 1957), the significance of unilateral renal disease in patients with hypertension can be assessed. The effect of nephrectomy in such circumstances has been well recorded (Smith 1956, Thompson 1957).

Because hypertensive patients suitable for nephrectomy are usually referred to the surgeon from medical depart-

BLOOD-PRESSURES IN EIGHTEEN CASES BEFORE AND AFTER PARTIAL NEPHRECTOMY OR NEPHRECTOMY
Cases 1–6 showed a rapid, significant, and sustained fall in blood-pressure

Case no.	Age (yr.)	Sex	Type of nephrectomy	Length of follow-up	Blood-pressures before operation (mm. Hg)			Blood-pressures after operation (mm. Hg)									Difference between mean blood-pressure before and after operation
								1 mo.		3 mos.		6 mos.		1 yr.		Mean	
					Systolic	Diastolic	Mean	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic		
1	29	F	Left	2½ yr.	130	80	105	115	70	120	70	115	70	112	72	93	12
2	53	F	Right	1 ,,	145	95	120	110	75	115	70	115	80	120	80	94·3	25·7
3	49	F	Left partial	6½ ,,	140	80	110	122	68	120	70	120	75	120	70	95·5	14·5
4	35	F	Right	1½ ,,	130	85	107·5	115	80	110	80	105	70	110	75	93	14·5
5	44	F	Left	3 ,,	120	80	100	100	60	110	75	105	70	100	60	85	15
6	38	M	Right	7 mos.	135	85	110	125	70	115	75	125	75	..	..	97·5	12·5
7	35	F	Right	3 yr.	140	90	115	130	80	140	95	140	90	140	90	113	2
8	39	M	Left	2 ,,	135	90	112·5	125	95	140	95	130	90	130	90	112·5	0
9	54	F	Left	1½ ,,	140	85	112·5	140	90	140	80	150	95	135	75	113	−0·5
10	38	F	Right	9 mos.	115	75	95	115	70	120	75	115	75	..	..	95·8	−0·8
11	32	M	Left	1 yr.	110	80	95	110	75	110	75	110	75	120	70	93·1	1·9
12	67	M	Left partial	4 ,,	140	90	115	140	90	130	80	140	85	135	80	110	5
13	18	M	Left	1 ,,	130	80	105	140	75	140	80	135	80	130	75	106·9	1·9
14	29	M	Right	1 ,,	110	80	95	110	75	115	80	120	80	120	80	97·5	−2·5
15	23	M	Left partial	1 ,,	140	80	110	140	80	140	80	140	80	140	85	110·6	−0·6
16	58	M	Left	4 ,,	140	80	110	140	80	140	80	140	85	140	85	110·1	−0·1
17	32	F	Right	2 ,,	125	80	102·5	130	80	130	70	130	70	140	70	102·5	0
18	43	F	Left	9 mos.	130	80	105	145	90	155	95	150	90	..	..	120·8	−15·8

ments, it is reasonable to assume that careful and valid blood-pressure readings will both precede and follow surgical intervention. But the significance of blood-pressure readings may be overlooked when the primary indication for surgery is urological: in such circumstances the preoperative blood-pressure may be interpreted as normal, whereas, in retrospect, it was relatively raised and it is the postoperative reading which is normal.

Since 1952, thirty patients have undergone surgery for unilateral calculous disease of the kidney at Hammersmith Hospital. In twenty-two cases blood-pressure records were adequate, but four of these patients had concomitant frank hypertensive disease. This is a retrospective study of the blood-pressure of the remaining eighteen patients, who were otherwise apparently healthy but who underwent nephrectomy (fifteen patients) or partial nephrectomy (three patients). Before operation they were all considered normotensive, for their blood-pressures fell within the standard variation from the mean normal blood-pressures in relation to age (Hamilton et al. 1954). Calculous pyelonephritis was later demonstrated histologically in all cases.

No special methods were used to record the blood-pressures: in hospital they were taken with the patients resting in bed, while follow-up readings were taken for the most part with the patients seated, though sometimes they were supine on an examination couch.

The length of follow-up ranged from 7 months to 6½ years. In only three cases was the follow-up less than a year (7, 9, and 9 months in cases 6, 10, and 18 respectively). Postoperative falls in blood-pressure were regarded as significant when the difference between the preoperative and postoperative mean blood-pressure was 10 mm. Hg or more.

Using this criterion six of the eighteen patients showed a rapid, significant, and sustained fall in blood-pressure after operation—one after partial nephrectomy and five after nephrectomy (see table and fig. 1). Five of these six patients were females, and this sex preponderance contrasts with the sex distribution of the twelve patients who showed no fall in blood-pressure after operation (fig. 2).

The age-incidence of the groups of patients with and without a fall in blood-pressure was not significantly different (fig. 3).

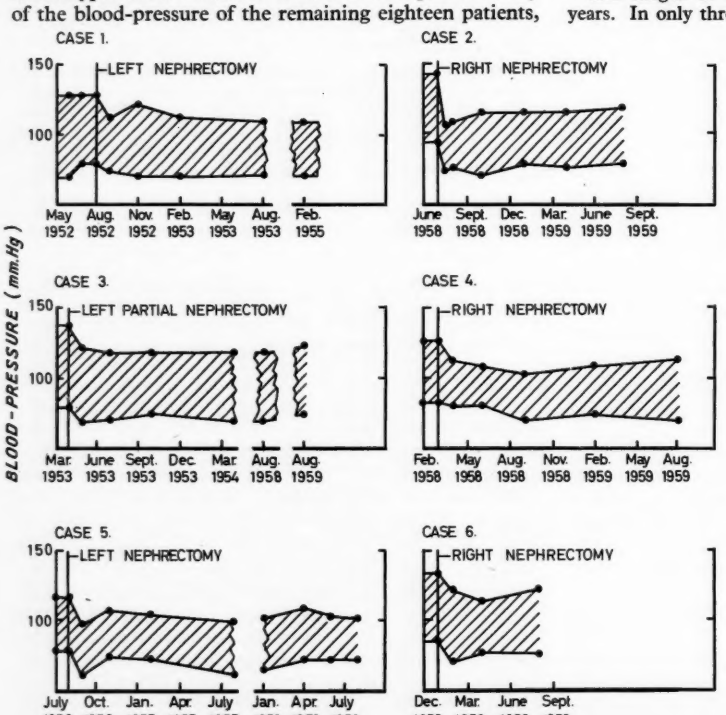


Fig. 1—The six cases which showed significant fall in blood-pressure after operation.
The fall in blood-pressure is dramatic in onset, and sustained.

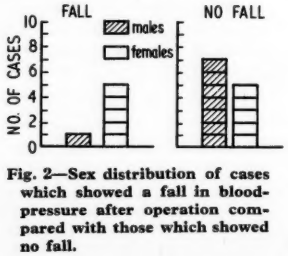


Fig. 2—Sex distribution of cases which showed a fall in blood-pressure after operation compared with those which showed no fall.

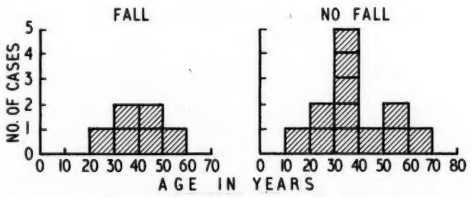


Fig. 3—Age-incidence of cases which showed a fall in blood-pressure after operation compared with those which showed no fall.

Histological examination of the operative specimens showed calculous pyelonephritis in all cases; but without significant histological difference between the patients with and without a fall in blood-pressure after operation.

Discussion

This investigation suggests that some apparently normotensive patients who undergo nephrectomy or partial nephrectomy for unilateral calculous disease may later show a significant and sustained fall in blood-pressure, of rapid onset.

Smith (1956) recorded a significant fall in blood-pressure after nephrectomy for hypertension in 26% of five hundred and seventy-five cases of hypertension with apparent unilateral renal disease. The six cases referred to in this study, who were apparently normotensive before operation but who later showed a significant and sustained fall in blood-pressure after operation, may in fact have been early cases of renal hypertension.

The relation between pyelonephritis and the onset of hypertension still awaits resolution. Undoubtedly chronic pyelonephritis may, on occasion, cause hypertension; and, when the disease is unilateral, removal of the diseased kidney may be followed by restitution of the blood-pressure. On the other hand, some cases of chronic pyelonephritis are not associated with hypertension. This study does not help to solve the problem, but it does suggest that blood-pressures which are considered normal before nephrectomy or partial nephrectomy may, in fact, be relatively raised. Accurate blood-pressure observations both before and after surgery may confirm this suggestion.

Summary

Preoperative and postoperative blood-pressures of eighteen apparently normotensive patients submitted to nephrectomy or partial nephrectomy for unilateral calculous disease have been studied retrospectively. Calculous pyelonephritis was demonstrated histologically in all the specimens.

The length of follow-up ranged from 7 months to $6^1/_2$ years: in only three cases was it less than a year.

Six of the eighteen patients showed a significant, rapid, and sustained fall in blood-pressure after operation. Early renal hypertension may have been present in these six cases; and the blood-pressure should be recorded accurately before and after nephrectomy or partial nephrectomy is undertaken for urological disease alone.

REFERENCES

Graber, I. G., Shackman, R. (1956) *Brit. med. J.* i, 1321.
Gregg, D. M. (1958) *Post Grad. med. J.* **34**, 149.
Hamilton, M., Pickering, G. W., Roberts, J. A. F., Sowry, G. S. C. (1954) *Clin. Sci.* **13**, 11.
Hodson, C. J. (1957) *Proc. R. Soc. Med.* **50**, 539.
Howard, J. E., Connor, T. B., Bethrong, M., Thomas, W. C. (1957) *Bull. Johns Hopk. Hosp.* **100**, 241.
Maluf, N. S. (1958) *Surg. Gynec. Obstet.* **107**, 415.
Poutasse, E. F. (1956) *Circulation*, **13**, 37.
— Dunston, H. P. (1958) *J. Amer. med. Ass.* **165**, 1521.
— Humphries, A. W., McCormack, L. J., Corcoran, A. C. (1956) *ibid.* **161**, 419.
Schlegel, J. U., Savlov, E. D., Gabor, F. (1959) *J. Urol.* **81**, 581.
Smith, H. W. (1956) *ibid.* **76**, 685.
Thompson, G. J. (1957) *ibid.* **77**, 358.
Winter, C. C. (1957) *ibid.* **78**, 107.

CARCINOMA OF ŒSOPHAGUS TREATED BY EXCISION

K. S. MULLARD
M.A., M.B. Cantab., F.R.C.S.E.
THORACIC SURGEON, HAREFIELD HOSPITAL, HAREFIELD, MIDDLESEX

IT has been my policy to resect and restore immediately the continuity of the gut in all patients presenting with carcinoma of the middle or lower third of the œsophagus, and of the cardia—excluding only those with obvious metastases, and those whose general condition precluded any prospect of their surviving the operation. This policy was adopted about 12 years ago because the symptoms from these conditions, untreated, make life intolerable; because without treatment the prognosis is invariably hopeless; because no other form of treatment gave so much symptomatic relief; and because excision of the growth offered some prospect of permanent cure. As the years passed, my experience, and that of others (Ravitch et al. 1952, Garlock and Klein 1954, Sweet 1954), showed that few patients survived long, and the general impression of the results of œsophageal resection was gloomy. But even so, resection of the primary growth and immediate restoration of continuity seemed well worth while in view of the symptomatic relief which it gave.

Then, in 1956, Mousseau et al. introduced a permanent indwelling plastic tube with which dysphagia could be very greatly, though not entirely, relieved. Experience with this tube (Moghissi 1960) has shown that much relief can be obtained at a low operative risk. With this technique available it was clearly no longer justifiable to expose patients to the severe operative risks of resection, unless some additional advantage might be gained, either by increasing the expectation of life or by giving greater symptomatic relief. The results of treatment by excision were therefore reviewed, and are set out below.

The Series

The series comprised one hundred and forty patients, of whom forty were women, seen between 1948 and 1958. The average age at the time of diagnosis was 65, ranging between 39 and 85; one hundred and two were over 60, fifty-one were over 70, and ten were over 80. These figures show that it is not realistic to look for the customary 5-year survival in a group of patients of whom half have already reached the normal expectation of life for this country—67 years—at the time of diagnosis, and another quarter are within less than 5 years of it. Three main operative procedures were used.

Ivor Lewis Operation

For growths of the middle or lower third of the œsophagus, with the exception of those at the extreme lower end (last 2–3 cm.) the Ivor Lewis operation (Lewis 1946) was employed.

Through an upper paramedian incision the stomach is freed of its mesentery and all its vascular attachments, with the exception of the right gastroepiploic artery. The abdominal incision is closed; and, through a right thoracotomy, the thoracic œsophagus is excised, continuity being restored by drawing the stomach into the chest and anastomosing it to the œsophagus at the apex of the chest.

Forty-five cases fell into this group. The growth was an adenocarcinoma in five cases; polygonal in one; undifferentiated in one; and squamous in the remainder. Of this group, ten patients died within a month of operation; twenty-four died within a year of operation; three died within 18 months; and one died $2^1/_2$ years, and another $3^1/_2$ years, after operation.

Five are alive 18 months, 20 months, 4½ years, 6 years, and 6½ years after operation. One has been lost sight of.

Thus five out of forty-five lived more than 2 years.

Gastrectomy

The second operation used was total gastrectomy for growths of the extreme lower end of the œsophagus and cardia.

Through a left thoracoabdominal incision the entire stomach, the lower third or quarter of the œsophagus, the spleen, and the body and tail of the pancreas are resected in the extraperitoneal plane. Continuity of the gut is restored by œsophagojejunostomy, either end-to-side with enteroenterostomy between the arms of the jejunal loop, or by the Roux-Y technique. This procedure is on the lines described by Allison and Borrie (1949).

This group comprised twenty-three patients. Thirteen had adenocarcinomas; four had squamous-cell carcinomas; three had polygonal-cell carcinomas; two had columnar-cell carcinomas; and one had an undifferentiated carcinoma. Of these patients, eight died within a month of operation; six died within a year or less; two died within 18 months; one died after 4 years; and one after 4 years and 8 months. Four are alive 15 months, 5½ years, 7 years, and 7½ years after operation.

Thus roughly a third died from operation, another third died within 18 months, and over a fifth survived 4 years or more, three being still alive more than 5 years after operation.

Œsophagogastrectomy

Early in the series, before its disadvantages were known, and later on, but then only for technical considerations, a lesser procedure than total gastrectomy was used for growths of the lower end of the œsophagus and cardia. This was excision of the lower third of the œsophagus and upper half of the stomach, with restoration of continuity by œsophagogastrostomy.

This group also comprised twenty-three patients. The pathological types of tumour were about equally divided between squamous carcinoma and adenocarcinoma, with a few columnar-cell and undifferentiated carcinomas. Six of these patients died of operation; eleven died within the 1st year, and four within the 2nd year. One lived over 7 years, and another is alive 4 years after operation.

Thus only two of this group have survived more than 2 years.

Miscellaneous Procedures

A fourth group, comprising a miscellany of forty-nine patients, shows the extremely poor outlook in patients to whom no radical treatment can be given.

Seven were explored by laparotomy or thoracotomy and found hopelessly inoperable; all died within 6 months, and most within a few days or weeks. Eight had bypass operations, usually in the form of a Roux-Y œsophagojejunostomy, the primary growth being irremovable; one of these patients lived a year, and the others died within 6 months. Eleven were treated by intubation with Souttar's tube on one or more occasions; one lived for a year, and one for 6 months, and the others died within a few weeks. In ten cases, diagnostic œsophagoscopy only was performed; none lived more than 4 months. Eight had radiotherapy. Two patients with growths of the upper third of the œsophagus were treated by total resection of the thoracic œsophagus, followed by cervical œsophagogastrostomy; both died within 4 months of operation. One patient with carcinoma of the middle third of the œsophagus was treated by local excision and end-to-end œsophago-œsophagostomy; she lived 14 months. One patient was intubated with a plastic tube, and another refused all investigation and treatment; both died within 2 months.

RESULTS OF TREATING CARCINOMA OF ŒSOPHAGUS

Type of growth and operation	No. of cases	No. surviving after operation			
		1 mo.	1 yr.	18 mos.	2 yr.
Ca. of middle and lower thirds, treated by Ivor Lewis operation	45	35	13	9	5
Ca. of extreme lower end of œsophagus and cardia, treated by total gastrectomy (Allison)	23	15	10	7	5
Ca. of extreme lower end of œsophagus and cardia, treated by excision and œsophagogastrostomy	23	17	7	4	2
Miscellaneous cases, treated by intubation, bypass, &c., or untreated (excluding those treated by radiotherapy) *	41	29	4	0	—

* In this group, many of which were inoperable, survival periods are calculated from the time of diagnosis.

The results of radiotherapy are not within the scope of this article, and in any event the number of cases is small. But my experience confirms the generally accepted view that carcinoma of the upper third of the œsophagus responds satisfactorily to radiotherapy but growths of the middle and lower thirds do not.

Discussion

Of the hundred and forty patients with dysphagia due to malignant disease, a hundred and eight had a major surgical operation. Of these, ninety-three had resection of the growth with immediate restoration of continuity, eight had a bypass operation, and seven a laparotomy or thoracotomy only. Of the resections, ninety-one were for growths of the middle or lower thirds of the œsophagus and cardia.

The table shows the results in these ninety-one patients. For growths of the middle and lower thirds, rather fewer than a quarter died as a result of operation, and rather more than a tenth survived for 2 years or more. For growths of the lower end of the œsophagus and cardia for which total gastrectomy was used, a third died as a result of operation, and more than a fifth survived for 2 years or more; but when local resection was used, although the operative mortality fell from a third to a quarter, the 2-year survival prospect fell from a fifth to less than a tenth. Few patients survived long when local resection was used, and the results of operation were poor.

Local resection leads to local recurrence of the growth at the site of the œsophagogastric anastomosis, and with this recurs the same distressing dysphagia which characterised the disease at its onset. In addition the symptoms of a diaphragmatic hernia of stomach are produced, and these are far more troublesome when part of the stomach lies immediately above the diaphragm than they are after the Ivor Lewis procedure in which the entire stomach is drawn well up into the chest. Local resection has been abandoned, therefore, as a planned procedure. Intubation by the Mousseau-Barbin tube is likely to relieve the symptoms equally well, and with a far lower immediate mortality.

The Ivor Lewis and Allison operations are far more satisfactory. It is true that only a ninth of the patients survive the Ivor Lewis operation for more than 2 years; but after an initial period of adaptation, those who survive can usually take an almost normal diet, both liquid and solid, with enjoyment. If the growth recurs, it seldom does so at the site of anastomosis; hence the final demise usually results from distant metastases, which is a kinder process. In the

Allison operation, a fifth of the patients survived for 2 years or more—a far from hopeless prognosis. The period of adaptation to an œsophagojejunostomy is longer and more difficult than is the case after the Ivor Lewis operation, and considerable dietary restriction is usually required permanently; but this is not an unduly high price to pay for the prospect of long survival. Both operations, besides offering long survival, provide far greater symptomatic relief than can ever be obtained by intubation, where the patient is always restricted to an almost fluid diet.

Although the results of these major operations are marred by high operative mortality, this arose very largely in the first cases of the series when the operations were new and untried, and the complexities of technique and postoperative care were poorly understood. The present operative mortality is far lower, and in the future the figures should be lower still. Many authors, such as Collis (1957), have separated their earlier cases from their series, to show the present position.

Summary

Experience with a hundred and forty cases of œsophageal carcinoma between 1948 and 1958 suggests that the Ivor Lewis and Allison operations, for resection of growths of the middle and lower thirds of the œsophagus and cardia, offer good symptomatic relief and a prospect of long postoperative survival.

Less extensive resections and bypass operations give poor results, and they should be abandoned in favour of intubation by plastic tubes of the Mousseau-Barbin type.

REFERENCES

Allison, P. R., Borrie, J. (1949) *Brit. J. Surg.* **37**, 1.
Collis, J. H. (1957) *Lancet*, **273**, 613.
Garlock, J. H., Klein, S. H. (1954) *Ann. Surg.* **139**, 19.
Lewis, I. (1946) *Brit. J. Surg.* **34**, 18.
Moghissi, K. (1960) *Lancet*, i, 679.
Mousseau, M., Le Forestier, J., Barbin, J., Hardy, M. (1956) *Arch. Mal. Appar. Dig.* **45**, 208.
Ravitch, M. M., Bahnson, H. T., Johns, T. N. P. (1952) *J. thorac. Surg.* **24**, 256.
Sweet, R. H. (1954) *J. Amer. med. Ass.* **155**, 433.

PALLIATION IN MALIGNANT STRICTURE OF THE ŒSOPHAGUS

K. MOGHISSI
M.D., M.S. Chir. Geneva
SENIOR REGISTRAR IN THORACIC SURGERY, HAREFIELD HOSPITAL, HAREFIELD, MIDDLESEX

ŒSOPHAGECTOMY and re-establishment of the continuity of the digestive tract is the treatment of choice for malignant œsophageal stricture. But not all patients can benefit from œsophagectomy; many are regarded as inoperable owing to extensive growth, advanced age or poor general condition. In these "inoperable cases", however, relief from dysphagia by some palliative method should always be considered.

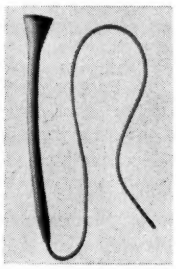


Fig. 1—The Mousseau-Barbin tube.

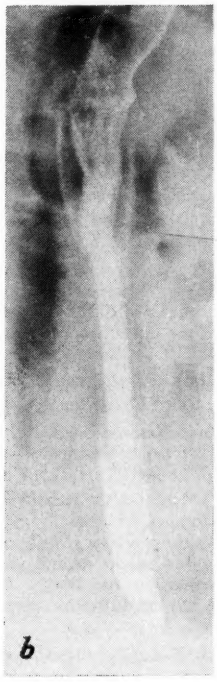


Fig. 2—(*a*) Barium-swallow in case 5 showing stricture of œsophagus and (*b*) the same case after insertion of the Mousseau-Barbin tube, showing the position of the flange above the stricture and of the cut end above the cardia.

Gastrostomy, once so popular, is a very unkind and unsatisfactory procedure; for, when food is put directly into the stomach its taste and the enjoyment of it are lost, and considerable discomfort, due to inability to swallow saliva, remains.

Many different procedures are used to bypass the growth by means of a transplant of small or large bowel, or to maintain patency by inserting one of the many indwelling tubes designed for this purpose.

I should like to describe a method used in the thoracic surgical unit at Harefield Hospital in seven cases of inoperable malignant stricture since November, 1958 (see table). Although the number of patients is small, the

PATIENTS WITH SEVERE DYSPHAGIA TREATED WITH MOUSSEAU-BARBIN TUBES

Case no.	Sex	Age (yr.)	Diagnosis	Histology	Level of stricture	Results
1	F	74	Carcinoma of œsophagus	Squamous-cell carcinoma	Middle third	Dysphagia relieved; died of bronchopneumonia 4 weeks after operation
2	F	82	" "	" "	Lower third	Dysphagia relieved; swallowing well 40 weeks after operation
3	M	41	Carcinoma of bronchus	" "	Middle third	Dysphagia relieved; died of ? rupture and hæmorrhage caused by tube 8 weeks after operation
4	F	78	Carcinoma of œsophagus	" "	" "	Dysphagia relieved; swallowed well for 17 weeks then died from general weakness
5	M	74	" "	" "	" "	Swallowing well 10 weeks after operation
6	M	75	" "	" "	" "	Swallowing well 8 weeks after operation
7	M	55	Carcinoma of bronchus	Oat-cell carcinoma	" "	Swallowing well 10 weeks after operation

results have been good. We shall therefore continue to use the method ourselves, and we recommend it to others for suitable cases.

Cases and Treatment

Five patients had carcinoma of the œsophagus which caused very severe dysphagia. In the other two dysphagia was due to involvement of the œsophagus by an inoperable bronchial carcinoma.

Method of Treatment

The method is based on that of Mousseau et al. (1956).

These workers use a special catheter (the Mousseau-Barbin tube) of 'Neoplex' plastic. This tube is 30 cm. long and has a diameter of 10, 12, or 14 mm.; its upper end is funnel shaped, and the lower end continues as a tail 5 mm. in diameter and 70 cm. long, resembling a Ryle's tube (fig. 1).

The catheter can be inserted in various ways. We use a variant of the designers' method, as follows:

1. A gum-elastic bougie is passed through the stricture into the stomach via an œsophagoscope. The œsophagoscope is then removed leaving the bougie in situ.

2. Laparotomy is performed through a small upper midline abdominal incision, and, after inspection of the intraperitoneal viscera, a fairly high gastrostomy is done, through which the end of the bougie is grasped. (If there is difficulty in introducing the bougie from above, it can be pushed up via the gastrostomy opening and the cardia to reach the mouth.)

3. The tail of the catheter can next be attached to the mouth end of the bougie, which is drawn out through the gastrostomy opening so that the end of the Mousseau-Barbin tube appears in the stomach.

4. By pulling out the end of the tube through the gastrostomy opening, the catheter proper gradually enters the œsophagus; some resistance is felt when it passes the pharyngo-œsophageal junction, and especially when it enters the stricture.

5. The position of the funnel-shaped flange of the catheter should be adjusted so that it lies just above the stricture. This is best done from above, by direct vision through the œsophagoscope.

6. The excess tube protruding through the gastrostomy is cut off as high in the stomach as possible. (The cut end often retracts to a position above the cardia.) (Fig. 2b.)

7. The gastrostomy is closed and the abdominal wall repaired.

We find that the operation is very much simplified if one member of the team carries on the œsophagoscopy and all the manipulation from the mouth, while another prepares the gastrostomy; then, with close cooperation, the tube can be inserted in the exact position required (fig. 2a and b).

Postoperative Management

For the first 24–48 hours after operation the patient should be given only fluids, thence progressing gradually to more solid food. Some patients may have slight regurgitation for a day or so, but this soon responds if the patient is nursed in Fowler's position and got out of bed as soon as possible.

Results

The table summarises the results. My colleagues and I have been impressed by the immediate relief of dysphagia, the simplicity of the operation, and the low operative mortality. In those cases with œsophageal stricture which is unsuitable for resection this seems to be a great improvement upon other palliative measures.

I should like to thank Mr. K. S. Mullard for permission and opportunity to publish this paper, and Mr. K. S. McDonald, photographer at Harefield Hospital, for reproducing the figures.

The Mousseau-Barbin tube is made by Messrs. Porges, Paris, France.

REFERENCE

Mousseau, M., Le Forestier, J., Barbin, J., Hardy, M. (1956) *Arch. Mal. Appar. dig.*, **45**, 208.

AGRANULOCYTOSIS AND SEPSIS ASSOCIATED WITH PREDNISOLONE

R. ROKSETH
M.D. Oslo
ASSISTANT PHYSICIAN

From the Department of Medicine, Nordland County Hospital, Bodö, Norway

HÆMATOLOGICAL side-effects during corticosteroid therapy are rare. Stevens and Toone (1952) and Toone and Irby (1955) mention 3 cases of leucopenia after cortisone injections. It is not clear whether the leucopenia was caused by cortisone itself or by some vehicle in the preparation. Heck (1956), however, includes cortisone among drugs which may cause leucopenia. Snively et al. (1953) mention a case of aplastic anæmia occurring after corticotrophin injections. Animal experiments indicate an adverse effect of cortisone on bone-marrow regeneration after X-radiation (Thiersch et al. 1952).

This paper reports agranulocytosis and sepsis in a patient after oral administration of prednisolone. We have not been able to find any similar cases described previously.

Case-report

A woman, aged 64, was in March, 1956, examined in hospital because of a moderately elevated sedimentation-rate, which had persisted for at least 3 years. No cause was found. The blood smear and the sternal marrow were normal.

In October, 1956, she received radiotherapy of the cervical spine for spondylarthrosis. She had during the previous 11 years received 3 series of therapy to the lumbar spine, and 2 to the cervical spine, totalling about 3000r.*

In March, 1957, erythema multiforme developed on both arms without any apparent cause. She was given prednisolone, 5 mg. three times daily, decreasing to 5 mg. daily. After a few relapses the eruptions ultimately disappeared in 3 or 4 weeks. She continued, however, taking the tablets " to be on the safe side ".

2 weeks later urticaria developed on the chest and abdomen. She felt ill and had a sore throat. Prednisolone was discontinued and the urticaria disappeared. Her general condition, however, deteriorated and she was admitted to hospital a week later with fever, pallor, weakness, and a purulent stomatitis. Clinical findings were otherwise normal.

Blood investigations.—Hb 9·1 g. per 100 ml., red cells 3,600,000 per c.mm., white cells 500 per c.mm., platelets 175,000 per c.mm. A blood-smear showed no polymorphs, only lymphocytes. The sternal marrow revealed normal erythropoiesis and thrombopoiesis, but in the granulopoiesis a maturation arrest at the stage of promyelocytes. A profuse growth of pyogenic staphylococci was cultured from the blood.

She was treated with erythromycin ('Ilotycin') and blood-transfusions, and the fever subsided in 3 days. The white-

* Irradiation given with filter $^1/_2$ Cu, tube-skin distance 40 cm., 170 kV. and 6 mA. Applicator size 10 × 24 cm. lumbar spine and 10 × 15 cm. cervical spine.

cell count, hæmoglobin, blood-smear, and sternal marrow were normal after 10 to 12 days. Scratch tests with a prednisolone solution were negative. She had taken no other drugs.

Clinical findings and blood-counts were normal 2 years later. The sedimentation rate was 30 mm. per hr.

Discussion

Agranulocytosis is usually due to drugs. The first symptoms in our patient, a sore throat and urticaria, appeared while she was taking prednisolone, and this synthetic corticosteroid was the only drug she had taken. The urticaria disappeared when prednisolone was discontinued and her condition improved with antibiotic therapy. This reinforces the supposition that prednisolone was responsible. It may seem paradoxical that an antiallergic drug could cause agranulocytosis, but agranulocytosis may also follow the giving of antihistamines (e.g., Blanton and Owens 1947, Hilker 1950, Drake 1950).

Other possible causes of leucopenia must be considered: (1) earlier radiation therapy; (2) possible underlying disease; (3) sepsis.

(1) Blood and marrow changes after radiation comprise the acute changes during the first weeks after exposure, and the late changes that appear gradually, months to years, after radiation (Medical Research Council 1956). While the acute damage may be reversible, the late changes, such as leukæmia and aplastic anæmia (Court-Brown and Doll 1956), seem to be irreversible (Hollaender 1954). According to present knowledge there is little reason to believe that acute agranulocytosis, with rapid complete restitution, can be caused by local routine radiotherapy several months or years earlier.

(2) The leucopenia during some diseases (measles, typhoid fever, &c.) is not as severe as in our case (Wintrobe 1956). Besides, clinical and laboratory examination did not reveal any underlying disease at the time of agranulocytosis or during controls up to 2 years later. The patient had evidently recovered from the original skin disease since no signs of erythema multiforme recurred.

(3) Sepsis may occasionally be accompanied by leucopenia, and severe infections may occur during corticosteroid therapy (Shaper and Dyson 1955, Slaney and Brook 1958). Wintrobe (1956), however, maintains that in patients with agranulocytosis and sepsis, the sepsis is to be regarded as secondary.

Summary

Agranulocytosis and sepsis developed in a woman of 64 who had been treated with prednisolone for erythema multiforme. There are reasons for believing that prednisolone was the cause.

I am grateful to Dr. Ole Storstein, former head of the department of medicine, Bodö Hospital, for his advice.

REFERENCES

Blanton, W. B., Owens, M. E. B. (1947) *J. Amer. med. Ass.* **134**, 454.
Court-Brown, W. M., Doll, R. (1956) Leukæmia and Aplastic Anæmia in Patients Irradiated for Ankylosing Spondylitis. M.R.C. Special Report Series no. 295.
Drake, T. G. (1950) *J. Amer. med. Ass.* **142**, 477.
Heck, F. J. (1956) *Med. Clin. N. Amer.* **40**, 1077.
Hilker, A. W. (1950) *J. Amer. med. Ass.* **143**, 741.
Hollaender, A. (1954) Radiation Biology; vol. I, part 2, p. 1164. New York.
Medical Research Council (1956) Hazards to Man of Nuclear and Allied Radiations; p. 10.
Shaper, A. G., Dyson, A. (1955) *Lancet*, i, 887.
Slaney, G., Brooke, B. N. (1958) *ibid.* i, 504.
Snively, G. G., Hattersley, P. G., Nolan, L. E. (1953) *J. Amer. med. Ass.* **152**, 1223.
Stevens, J. E., Toone, E. C. (1952) *Sth. med. J.* **45**, 738.
Thiersch, J. B., Conroy, L., Stevens, A. R., Finch, C. A. (1952) *J. Lab. clin. Med.* **40**, 174.
Toone, E. C., Irby, R. (1955) *Amer. J. Med.* **18**, 41.
Wintrobe, M. M. (1956) Clinical Hematology; p. 1097. London.

Preliminary Communication

PARABIOSIS INTOXICATION SYNDROME IN MICE

WE here report the development in parabiosed homologous mice of a condition resembling that known as the parabiotic intoxication syndrome of rats, first described by Ranzi and Ehrlich.[1]

We chose for parabiosis young adult female C3H and AKR mice, using a modification of the technique of Bunster and Meyer,[2] in which we did not incise the abdominal wall but merely sutured the flank muscles of the two animals together just below the costal margin. Excluding variable mortality in the first three postoperative days which was attributable to operation and to malnutrition due to mechanical difficulties of eating and drinking, the mortality was very low until the seventh day. In about 75% of the pairs which survived, however, one or both animals of a pair died between the seventh and fourteenth days. The peak mortality was at twelve days. 9 out of 53 pairs survived twenty-one days or longer, and of the pair which survived longest the AKR mouse died on the fifty-sixth day. In the pairs where only one mouse died, this was more often the AKR mouse.

The animals all became wasted, with roughening of their coats and loss of hair, but this was much worse in the AKR mice than in the C3H mice. These changes were not due to parabiosis, since pairs of AKR or pairs of C3H mice gained weight and had normal coats.

Pallor of the AKR mice attracted our attention; hæmoglobin studies revealed anæmia in all AKR mice, with hæmoglobin values under 6·0 per 100 ml. and normal or raised values in the C3H mice. In 61% of the C3H mice the hæmoglobin level exceeded 18·0 per 100 ml. In isologous parabiotic pairs, the mean hæmoglobin level was 14·4 per 100 ml. (S.D. 1·8).

White-cell counts showed comparable changes. The majority of AKR mice showed a profound leucopenia with values sometimes as low as 500 cells per c.mm., whereas the C3H mice showed normal or slightly high counts.

The similarity between the parabiosed mice and previously described "red" and "white" parabiosed rats [3 4] is striking. The mechanisms involved have still to be determined. But the constancy and degree of anæmia and leucopenia in the white mouse suggest that some mechanism is responsible for the parabiosis intoxication syndrome other than that postulated by Hall and Hall [4]—namely, that one animal develops anæmia because of loss of blood to the other member of the pair. This is being investigated further.

C. W. GURNEY
M.D. Chicago
Markle Scholar in Medical Sciences

K. B. TAYLOR
D.M. Oxon., M.R.C.P.
Rockefeller Fellow in Medicine

Argonne Cancer Research Hospital,
University of Chicago,
Chicago 37, Illinois

1. Ranzi, E., Ehrlich, H. *Z. Immun. Forsch.* 1909, **3**, 38.
2. Bunster, E., Meyer, R. K. *Anat. Rec.* 1933, **57**, 339.
3. Chute, R. M., Sommers, S. C. *Blood*, 1952, **7**, 1005.
4. Hall, C. E., Hall, O. *J. exp. Med.* 1956, **103**, 263.

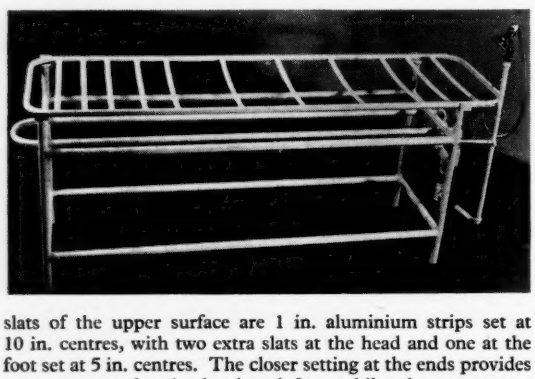
New Inventions

A TABLE FOR TREATING HEATSTROKE

THE essential principle in treating heat stroke is to cool the patient's body as rapidly as possible. Recommended methods employ one or other of two principles—convective cooling (the patient being immersed in an ice-cold bath) or evaporative cooling (the patient being wrapped in a wet sheet). Cooling by convection and evaporation simultaneously is an obvious advance. A treatment table designed for this purpose is shown in the figure. The table is so constructed that water can be sprayed from above and below at the same time. The top of the table is made of slats, between which water is directed upwards on to the patient's back, and water is also sprayed from above by a hand shower. Thus almost the whole skin surface of a patient can be cooled.

Cooling is achieved partly by heat exchange from the hot skin to the cold water, and partly by evaporation of water from the skin surface. The water acts as " artificial " sweat, for the patient's own sweat secretion has invariably ceased in heat-stroke. The room in which the treatment table is housed must be well air-conditioned and fitted with a powerful ceiling or wall fan so that the patient can be exposed to a current of cool dry air to enhance evaporative cooling.

The table is 7 ft. long, 2 ft. 6 in. wide, and 3 ft. high. The frame is made of simple 1 in. galvanised iron piping. The



slats of the upper surface are 1 in. aluminium strips set at 10 in. centres, with two extra slats at the head and one at the foot set at 5 in. centres. The closer setting at the ends provides more support for the head and feet, whilst the more open setting in the middle allows greater exposure of the skin of the back to the lower spray. The slats are welded to the piping at the edges. The $^3/_4$ in. pipes of the lower spray are set 6 in. below the slats. Water is delivered through $^1/_{16}$ in. perforations set 2 in. apart (5 between each pair of slats) and countersunk $^1/_{32}$ in. to produce a spray rather than a jet. The upper spray is an ordinary hand shower with a flexible metal hose and rose, as commonly fitted to domestic baths.

Chilled water, ideally at a temperature of 45°F (7°C), is delivered to the sprays at a pressure of 40–45 lb. per sq. in. through T-pieces which reduce from 1 in. to $^3/_4$ in. In Kuwait the chilled water comes from one of three sources:

1. A 6-in. chilled-water main serving a central air-conditioning plant; this circulates at 42–45°F (6–7°C).

2. A small 3–5 h.p. 'Freon' refrigeration unit. The cold water produced is stored in an insulated 400-gal. tank which ensures an adequate supply at about 42–45°F.

3. A 15–20 h.p. freon refrigerating unit which cools water directly as it passes through.

Tables of this type have been in use in our hospital for the past eleven years and have been very satisfactory. Rectal temperatures may be reduced by this means from 106–110°F to 102°F within twenty to thirty minutes.

We wish to thank the Kuwait Oil Company management for permission to publish this account; Dr. Charles Leithead, of the Liverpool School of Tropical Medicine, for much assistance; and Mr. L. D. Reeves, of the Kuwait Oil Company engineering department for having the table made.

J. GUTHRIE
M.B. Edin.
Kuwait Oil Company Ltd. Chief Medical Officer

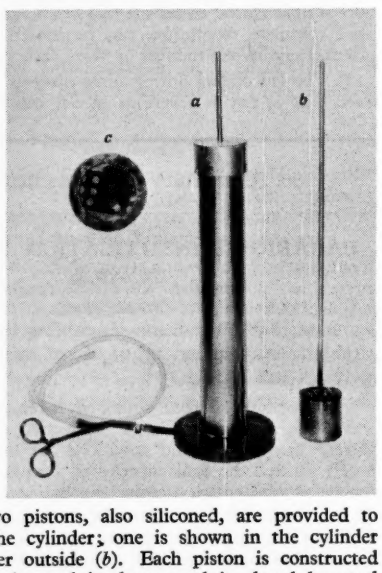
A. V. MCCRACKEN
Magwa Hospital, Kuwait Assistant Hospital Secretary

A SIEVING DEVICE FOR PREPARING BONE-MARROW FOR INTRAVENOUS INFUSION

THE material aspirated by multiple bone-marrow puncture comprises marrow particles, fat, and blood, though much of the marrow is intimately mixed with the fat. McFarland and Mathé [1] have transfused such material intravenously immediately after aspiration without harm, but if transfusion is delayed beyond a few minutes, and particularly if low-temperature storage is employed, the fat solidifies and much of the myeloid tissue is trapped. Since the solid fat cannot be resuspended, transfusion of the material in this condition would be hazardous; and removal of the fat would involve loss of many marrow-cells. Donnall Thomas [2] overcame this difficulty by passing the marrow repeatedly through sieves of decreasing pore size, and then separating the fat by gentle centrifugation. Very few cells are lost in the fat layer, and this technique has the added advantage of reducing the size of the larger cell clumps.

My apparatus has proved more convenient than other sieving syringes, and its use makes for greater speed and sterility than did previous techniques.

The marrow is aspirated into syringes containing a little heparinised tissue-culture fluid, and delivered into a siliconed 540 ml. transfusion bottle. Using non-wettable polyvinyl-chloride tubing (detached from a disposable recipient set), the suspension is transferred to a siliconed stainless-steel cylinder 10 in. high and of $1^3/_4$ in. bore, through a Luer inlet at the base. The rubber segment of the inlet tube is then occluded with artery forceps (see figure). Two pistons, also siliconed, are provided to fit snugly into the cylinder; one is shown in the cylinder (*a*), and the other outside (*b*). Each piston is constructed as a hollow cylinder and its lower end is closed by steel gauze—40 mesh for the coarser sieve, and 200 mesh for the finer sieve. The lower surface of the piston with the coarser sieve is seen in the insert (*c*). The sieves have pore apertures of 380 μ and 80 μ. The marrow suspension is sieved several times with the coarser piston, and then with the finer piston. At the end of this process the marrow is returned through the tubing to the original bottle to be centrifuged. Afterwards the fat and most of the heparinised supernatant fluid are aspirated through a wide-bore needle.



The suspension is transferred between the bottle and the cylinder by gravity, assisted when necessary by moderate positive or negative air-pressure applied to the bottle. The

1. McFarland, W. *Blood*, 1958, **13**, 289; Mathé, G., Jammet, H., Pendic, B., Schwarzenberg, L., Duplan, J. F., Maupen, B., Laterjet, R., Larrieu, M. J., Kalic, D., Djukic, R. *Rev. Franç. Clin. Biol.* 1959, **4**, 226.
2. Thomas, E. D. *Blood*, 1955, **10**, 600.

device handles 200–250 ml. of fluid at a time. It has an aluminium cap, perforated to take the piston handle, and a heavy brass base. Otherwise it is constructed entirely of stainless steel. The apparatus may therefore be sterilised in an autoclave. All internal surfaces are treated with 'Midland' silicone (M.S. 1107) cured at 150°C for 15 minutes.

The apparatus can be obtained through Mr. N. H. Pierce of the physics department, Westminster Medical School, London, S.W.1. I am indebted to Mr. Pierce and to Mr. M. Phillips for constructing the prototype, and to Dr. P. Hansell for the photograph.

Radiotherapy Department,
Westminster Hospital, London, S.W.1

DAVID E. PEGG
M.B. Lond.

Reviews of Books

Encyclopædia of Urology

Editors: C. E. ALKEN, Hamburg, V. W. DIX, London, H. M. WEYRAUCH, San Francisco, E. WILDBOLZ, Berne. Berlin: Springer. 1959.

Vol. VI. *Endoscopy*. R. W. BARNES, M.S., M.D., D.SC., F.A.C.S., professor of surgery, R. T. BERGMAN, B.SC., M.D., F.A.C.S., clinical professor of surgery (urology), H. L. HADLEY, M.D., F.A.C.S., assistant professor of surgery (urology), School of Medicine, College of Medical Evangelists, Los Angeles, California. Pp. 282. DM 136.

Vol. IX/2. *Specific Inflammations*. EINAR LJUNGGREN, professor of surgery, University of Göteborg. R. CAMPBELL-BEGG, M.SC., F.R.C.S.E., F.A.C.S., F.R.A.C.S., Johannesburg. AMBROSE J. KING, M.B., F.R.C.S., senior physician, The London Hospital Clinic for Venereal Disease. Pp. 564. DM 158.

Vol. XV. *Urology in Childhood*. D. INNES WILLIAMS, M.D., M.CH., F.R.C.S., surgeon, St. Peter's and St. Paul's Hospitals, genitourinary surgeon to The Hospital for Sick Children, Great Ormond Street, London. Pp. 353. DM 118.

THE idea of an Encyclopædia of Urology in 16 volumes (each published separately in English, French, and German) providing a standard international work of reference is something exceptional in a specialty of medicine. The editors, from Great Britain, Germany, Switzerland, and the U.S.A., have set out to compile a mass of authoritative information on all aspects of urology, and they have the aid of well-informed and experienced urologists. The three volumes now available reflect the wide range of the work and the broad geographical distribution and international repute of the authors. There is little doubt that the complete encyclopædia will ultimately rank as a reference work without equal.

Volume VI is a compact and comprehensive guide to urological endoscopy, giving details of the wide range of instruments available and their use in diagnostic and surgical procedures. Of particular merit is the orderly sequence in the description of endoscopic methods and the interpretation of the appearances of the lower urinary tract in health and disease. These appearances are profusely illustrated in colour and half-tone. The second half of this volume is concerned with endoscopic surgery and contains valuable information on training in this specialised art, details of the equipment and electrical apparatus required, and of the various indications for its use. The technique of endoscopic prostatic resection with the Stern-McCarthy electrotome is fully described, but little space is given to the cold-punch procedure, which is not illustrated.

Volume IX/2 deals with tuberculosis, parasitic infestations, and certain forms of venereal disease. Ljunggren gives a masterly description of urogenital tuberculosis, its modification by chemotherapy, and the present scope of surgical treatment, based on a wide personal experience and supplemented by that of other well-known authorities. Campbell-Begg gives an exhaustive account of parasitic disease, from vegetable and protozoan invaders to a solitary lower-vertebrate intruder. This fascinating study, embracing schistosomiasis, hydatid disease, and various helminth infestations, set against a full background of comparative zoology, must be unequalled in urological literature. King's third section is about specific types of venereal infection including syphilis, lymphogranuloma venereum, granuloma inguinale, and chancroid. Each is considered particularly in terms of diagnosis and effective treatment and useful descriptions are given of the appropriate confirmatory tests and modern methods of chemotherapy. Gonorrhœa is discussed in volume IX/1.

Volume XV deals with urology in childhood, a specialty within a specialty, which has been exceptionally developed in Great Britain; so it is fitting that this volume was entrusted to Innes Williams, whose embryological research and work on the structure and dynamics of the urinary tract in childhood have attracted international attention. As he points out, with the general advance of pædiatric and preventive medicine, acquired disease is becoming rarer and congenital abnormalities consequently provide a large part of the urologist's work and occupy much of this book. There are also important sections on enuresis and the neurogenic bladder, and on the variations exhibited in childhood by such conditions as lithiasis, inflammatory disorders, and neoplasia, which are perhaps more familiar in adult life. This admirably balanced volume ends with a comprehensive study of intersex and endocrine disorders.

Each volume on its own merit is an outstanding contribution to the study of urology. To some British readers the format may seem strange, for no separate chapters are discernible, but an excellent index and ample references resolve this difficulty.

Growth Diagnosis

LEONA M. BAYER, associate clinical professor of medicine, Stanford University School of Medicine; NANCY BAYLEY, chief, section of child development, National Institute of Mental Health. Chicago: University of Chicago Press. London: Cambridge University Press. 1960. Pp. 241. 80*s*.

THIS book is an attempt to provide the pædiatrician with a guide to useful procedures in assessing the growth and development of children under his care. The authors assume familiarity with the basic facts of growth and do not attempt to record them here. They describe how to measure height, weight, sitting height, and biacromial and bi-iliac diameters; how to take front, side, and rear view body photographs; how to use the Greulich-Pyle skeletal-age atlas, and how to plot the anthropometric values on charts and tables. Some of the methods they advocate are not those now thought best. The standard tables date from 1931, and so, by the looks of things, does the instrument for measuring hip width. In charting weight deviation in terms of standard deviations rather than percentiles, the authors will have few supporters, but they break new and interesting ground in providing charts for height and weight against age which allow for advancement and retardation in maturity.

The last two-thirds of the book is occupied with descriptions of 8 normal children and 22 children with growth disorders. These are of much interest; they are very well illustrated and often the children are followed over long periods of time with body measurements, photographs, and skeletal age determinations. Dr. Bayley's method of predicting adult height from age and skeletal maturity is fully tested and emerges very creditably indeed even from this trial by pathology. This is a book for pædiatricians to ponder over, and for others (not least, since the layout is excellent, those contemplating publishing) to glance through. It invites criticism in detail but deserves nothing but praise in intention and general outline.

Fundamental Techniques of Plastic Surgery

IAN A. MCGREGOR, F.R.C.S., F.R.F.P.S., plastic surgeon, Glasgow Royal Infirmary. Edinburgh: E. & S. Livingstone. 1960. Pp. 244. 30*s*.

THIS volume is in two parts: the first section of 141 pages deals with basic techniques of plastic surgery, and the second explores certain clinical applications. The exposition of basic techniques is almost wholly confined to problems of skin cover, and within these limits it is excellent; the text is clear, the drawings are helpful, and the photographs of favour-

able results are very encouraging. Mr. McGregor gives detailed attention both to surgical technique and to the special instruments appropriate to plastic surgery. He discusses fully such matters as keloid formation, the use of the Z-plasty, the factors governing the " take " of free grafts, and the scope and management of skin flaps and tubed pedicles.

The second part of the book contains a chapter on general surgery, which deals with methods of skin repair of lips, limbs, scalp, breast, and anus; and the minor role of grafting in the treatment of leg ulcers is outlined. Skin problems in orthopædic cases, eyelid repairs, and hand injuries are also discussed. But the casualty surgeon, as well as the surgeons in other specialties for whom the book is designed, will find no information on such matters as acute fractures of the malar bone or the nose, or the treatment of any congenital deformity; and well-tried plastic procedures involving the use of epithelial inlays, fascial grafts, bone grafts, cartilage grafts, and fat grafts are not discussed. It is strange that these important matters are excluded, while methods of reconstructing of the eyelids are elaborately described and illustrated.

The index lacks some important headings, including " bone ", " fracture " (except finger), " palate ", " jaw ", and " burns ". The reader's difficulty in finding what he wants is aggravated by the decision to exclude all eponyms, and many surgeons will not easily recognise the familiar Abbe flap disguised as the " V-lip-switch-flap ".

With these reservations this is a well-produced book.

Public Health in the Town of Boston: 1630-1822

JOHN B. BLAKE. Cambridge, Mass.: Harvard University Press. London: Oxford University Press. 1959. Pp. 278. 52*s*.

THE main purpose of this book is to study the effects of imported infectious diseases, mainly smallpox and yellow fever, on the history of Boston. Smallpox reigned supreme among the epidemics of the eighteenth century. It flourished in all climates; it could be diagnosed with reasonable certainty; and it was the main battle ground between those who attributed the spread of infection to contagion and those who blamed " the depraved constitution of the atmosphere ". In the face of smallpox the contagionists won easily, but yellow fever set problems which were not solved until much later. (It is usually assumed that in a place so far north as Boston yellow fever was spread by *Aedes ægypti* imported in the bilges and water-butts of ships coming from ports where the disease was rampant. Is it possible that some native vector took its place?) In Boston the struggle between those who favoured inoculation against smallpox and those who feared—with some reason—that the practice would spread the disease was prolonged, as in London, until the introduction of vaccination. This book makes it clear that inoculation was largely the privilege of the rich. In contrast the most striking thing about Jenner's discovery was the speedy dissemination of the new knowledge and its immediate acceptance. Besides the prevention of infectious disease brought from elsewhere, the other continuous care of the town authorities—and alien readers would have valued a short account of the organisation of local government—was the cleaning of the streets and the disposal of offensive wastes. It was good work usually done for the wrong reasons.

These are interesting topics; but, though this book adds a lot to our knowledge of the parish-pump politics of Boston, it adds little to epidemiology. Numerical data for the period are scanty, but such as there are are relegated to the appendix. Little is said about diseases other than smallpox and yellow fever. The " camp fevers " were presumably typhus, typhoid, relapsing fever, and dysentery. The " sore throat distemper " in 1735 may have been diphtheria; if so, it came earlier than any recognisable epidemic in England. There must be more information than we are given about tuberculosis and syphilis. All the diseases mentioned were importations from Europe. Malaria appears once in the index but the reference is to ague, and in the 17th century this might be any acute fever. Indeed the author seems unfamiliar with the European background in the early years. A fatalist attitude to epidemic sickness may have been characteristic of the New England puritans but was equally apparent in Rome or Oxford.

Diagnostic Radio-Isotopes

CHARLES A. OWEN, Jr., M.D., PH.D., SC.D., associate professor of clinical pathology, Mayo Foundation Graduate School, Rochester, Minnesota. Oxford: Blackwell Scientific Publications. 1960. Pp. 425. 126*s*.

THIS is an excellent book—authoritative, lucid, and concise. It begins with chapters on counters and counting, which could hardly be bettered, and are extremely well illustrated. There follows a timely warning on radiation protection, short and to the point. The real substance of the book, however, lies in the chapters on metabolism, hæmatology, and the investigation of the gastrointestinal tract and cardiovascular system: each is a model of its kind, and is followed by an exhaustive bibliography (there are 528 references to iodine and the thyroid gland alone). No-one could read the book without profit and pleasure.

It is unfortunate that so useful work should come to the British market so late, for the bibliography does not extend beyond 1956. This makes some sections—for instance, that on labelled insulin—notably incomplete. Unimportant in itself, it is noticeable in a book remarkable otherwise for its thoroughness. It is beautifully produced, well up to the publishers' high standards, and must be assured of many readers among those primarily interested in radioactive isotopes.

Detoxication Mechanism

2nd ed. R. TECWYN WILLIAMS, PH.D., D.SC., professor of biochemistry, St. Mary's Hospital Medical School. London: Chapman & Hall. 1959. Pp. 796. 126*s*.

THIS book has increased greatly in wisdom and stature since the first edition, which amounted to only 288 pages, and the author of this mature work is to be congratulated on the way he has brought up his child. Students of the first edition need have no hesitation about acquiring the second, though they may regret the spectacular increase in price.

Others less familiar with the importance of this rapidly expanding corner of medicine should know that the author has compiled a well-documented study of the way in which many of the well-known drugs are handled by the body after administration: not only drugs, but all the hundred-and-one compounds that are now so apt to get into the body from pesticides, food additives, cleaning agents, and so on. The historical touches here and there and the references to early discoveries are a pleasant addition to the text. Apart from their interest and value, they show too how much the reader is beholden to the industry and balanced judgment of the author. The book is an essential for the chemical pathologist, and a study of many of these reactions is likely to become an integral part of his training, if not that of all medical students in the years to come.

Diagnosis of Congenital Heart Disease (2nd ed. Chicago: Year Book Publishers. London: Interscience Publishers. 1959. Pp. 866. 203*s*.).—The new edition of this outstanding book, first published in 1955, is larger by approximately 200 pages but follows closely the pattern of its predecessor. The authors (Sven R. Kjellberg, Edgar Mannheimer, Ulf Rudhe, and Bengt Jonsson), who form the cardiological team in the pædiatric clinic at Karolinska Sjukhuset in Stockholm, have now investigated in detail 742 cases of congenital heart-disease—nearly double the number seen at the time of the first edition—and they have thus been able to revise some of the earlier descriptions in the light of further experience. Four new chapters have been added dealing with uncommon malformations not included in the previous edition, or in some cases incorrectly diagnosed at the original examination; and the sections on atrial septal defect and anomalous pulmonary venous drainage have been carefully revised. All aspects of each malformation are clearly presented, but once again it is the angiocardiograms that catch the eye, and demonstrate how much information can be gained by selective angiocardiography. Their excellence may perhaps be equalled but is unlikely to be surpassed.

THE LANCET

LONDON 26 MARCH 1960

Immunisation Against Helminths

IT is easy for anyone in this country to become smug about helminths, and to assume that nothing but improved sanitation is needed to eradicate them (except, of course, threadworms, which are at least as common in doctors' families as elsewhere). Of the three general methods of dealing with infestations—drugs, hygiene, and immunisation—drugs are often ineffective or, if effective, not curative, since a worm in the tissues can be almost as much trouble dead as alive. The complex life-cycles of the helminths make them exceptionally vulnerable to preventive measures. If waterworks, water-closets, mosquito control, and food inspection were universal they would render mankind invulnerable to nearly all the clinically important worms; but over much of the world these are still visions of the future, and in many places helminth infestation of one kind or another is a major factor in the economic backwardness that hinders sanitation. Meanwhile, immunisation, the method hitherto thought impracticable, has been shown to deserve fresh thought and trial.

Unquestionably, helminths can excite immune reactions. In some infestations (trichinosis, for instance) one attack protects to a large extent against reinfection, while in others familiar reactions such as the Casoni test for echinococcosis and various sensitisation phenomena afford less direct evidence. The trouble in harnessing such immune reactions is apparently twofold. In many infestations the adult worms, lying free in body cavities or encysted, seem to be inaccessible to antibodies, and in others, such as filaria and schistosome, they seem to be untouched though not encysted. Furthermore, no dead vaccine or extract so far devised has produced adequate immunity: apparently only a live worm in the body is fully active immunologically. Until recently this appeared to be an insuperable obstacle; but in the past few years it has been partly overcome by investigators whose work may prove to have wide applications.

Husk of cattle is a disease of considerable economic importance in this and other countries. It is due to the nematode *Dictyocaulus viviparus*. The adults live in the bronchi: the eggs are coughed up and swallowed and hatch into larvæ before being passed in the fæces. Larvæ are eaten with the grass by a new host, penetrate the intestine, and migrate to the mesenteric lymph-nodes and thence by the blood-stream to the lungs, where they mature into adults. The lungs may contain thousands of worms, and in calves the disease is often severe and may be fatal. Intensive farming methods, by increasing the number of cattle per acre, increase the liability to the disease. Survivors are immune from further attacks; and a group of workers at the Glasgow Veterinary School [1] found that experimental infection likewise protected against reinfection. They showed also that a significant—though in practice useless—degree of immunity could be produced by injecting large amounts of homogenised dead worms with adjuvants, and that passive immunity could be produced by injecting the serum of immune animals. The key advance, however, was their recognition that irradiated larvæ might invade the tissues and live there long enough to set up an immune reaction, but die before they could reach the lungs and cause disease. The right doses of larvæ and of irradiation were not easily achieved. With doses below about 20,000r the larvæ survived to produce disease: with doses above 50,000r, the larvæ died too soon to cause immunity. But a single oral dose of 1000 larvæ irradiated with 40,000r, given to calves later exposed to infection either artificially or by grazing on heavily infected pastures, produced roughly tenfold reduction in morbidity and mortality,[2] and two such doses, at a month's interval, gave complete immunity.[3] Problems of producing the vaccine on a large scale have been overcome, and the commercial success of the method has been assured by field trials.

If this were all, it could be readily argued that the method might not be generally applicable. The worm concerned has a relatively long period of larval migration, during which an immune reaction has plenty of time to develop. But the same Glasgow group has now shown that two further nematodes can be tackled in much the same way—*Hæmonchus contortus*, the stomach worm of sheep,[4] and *Uncinaria stenocephalus*,[5] a hookworm of the dog. This finding, by widening the range of species, both of host and parasite, increases the probability that the method is generally applicable. But it also destroys the argument that extensive migration in the tissues is essential. The dog hookworm can infect through the skin like the human hookworm, but it is more usually ingested and then reaches the gut directly without any migratory stage: both vaccine and challenge dose were given orally in these experiments. As for hæmonchus, standard accounts suggest that no more penetration is achieved at any stage than is necessary for its attachment to the sheep's stomach, though there is now some evidence that there may be some penetration of the mucosa by larvæ.

By this ingenious method of using irradiated larvæ it might prove possible to prevent natural infection in man by blocking the original penetration or attachment of the larvæ. Such immunisation, by reducing the number of carriers as well as by promoting the general health of the community, could be at least a valuable adjunct to the hygienic attack on any worm infestation. Extension of the method to man presents special difficulties: often he will be himself the only source of parasites, and the only test object; and the organisation of safe clinical trials may be a most anxious matter. But the rewards could be great. Which species will prove susceptible, and which resistant, only experiment can tell. Judging by the results with uncinaria it might be well to make a start on hookworms.

1. Jarrett, W. F. H., Jennings, F. W., McIntyre, W. M., Mulligan, W., Urquhart, G. M. *Proc. R. Soc. Med.* 1958, **51**, 743. Jarrett, W. F. H., Office International des Epizooties, 1959, rapp. 512.
2. Jarrett, W. F. H. *Vet. Rec.* 1957, **69**, 1329.
3. Jarrett, W. F. H., Sharp, N. C. C. *Amer. J. vet. Res.* 1959, **20**, 522.
4. Jarrett, W. F. H., Jennings, F. W., McIntyre, W. M., Mulligan, W., Sharp, N. C. C. *ibid.* p. 527.
5. Dow, C., Jarrett, W. F. H., Jennings, F. W., McIntyre, W. I. M., Mulligan, W. *J. Amer. vet. med. Ass.* 1959, **135**, 407.

Cæsarean Section and Hyaline Membrane

HYALINE membrane is, it seems, especially liable to form in the lungs of infants born by cæsarean section.[1–3] LATHAM et al.[4] made a pathological study of the lungs of 407 infants weighing over 1000 g. Hyaline membrane was found in 124 (31%), of whom 36 (79%) had been delivered by cæsarean section. SOIVA [5] reported that in infants delivered by cæsarean section respiratory difficulty with cyanosis sometimes appeared in the first few hours of life, and in such cases hyaline membrane was found at necropsy. MCNEILL [6] believed that there was an inherent perinatal loss of the order of 1% in infants delivered abdominally: these deaths were attributable to hyaline-membrane disease and to atelectasis. Hyaline membrane has also been found with some frequency in the lungs of infants whose mothers had diabetes mellitus.[2 4 7] WINTER and GELLIS [7] found hyaline membrane in the lungs of 60% of infants who died in the neonatal period and whose mothers had diabetes; and both these workers and NESBITT and ANDERSON [8] emphasised that many of these infants had been delivered by cæsarean section. CARDELL [9] examined the lungs of 12 infants of diabetic mothers delivered by cæsarean section. Only 1 weighed under 2500 g. at birth, and all had a period of gestation between 34 and 36 weeks. 11 showed hyaline-membrane formation.

SNYDER [10 11] suggests that infants delivered by cæsarean section at term aspirate the fluid which surrounds them before delivery, and that this fluid is concerned in the subsequent development of a hyaline membrane. Maternal complications such as accidental hæmorrhage or placenta prævia may lead to contamination of the liquor amnii with blood; and, if the membranes have been ruptured for some time before delivery, bacterial contamination is a further possible hazard. SNYDER [12] regards blood and debris found in the air passages and lungs at necropsy as evidence of intrauterine respiration. A similar chain of events was demonstrated experimentally in the rabbit.[13 14] SNYDER [10] has investigated the cases of 56 infants delivered by cæsarean section at term. All weighed over 2500 g.; 12 were stillborn and 44 liveborn but died within three days. In over 90% necropsy yielded evidence of respiration before delivery, characterised by the presence of blood, epithelial cells, and debris in the air passages. 15 infants were delivered by section before the onset of labour, and in each of them blood was found in the bronchi and alveoli; in 14 of the 15 a hyaline membrane was also present. Of the remaining 41 infants 29 were liveborn and 12 stillborn. Section had been carried out during labour in these cases. Of the 29 liveborn infants 28 had blood in the lungs (in considerable quantity in 18 cases); epithelial cells, cornified cells, and debris were found in the lungs of all the infants; in 13 of the 29 a hyaline membrane was found. None of the 12 stillborn fœtuses showed any evidence of maceration. Histological examination of the lungs revealed blood in the air passages, and this was pronounced in 5 cases; epithelial cells and debris were found in all cases, but *no* membrane was seen in the lungs of any of the 12. Thus the incidence of hyaline membrane was much higher in the groups of infants delivered before the onset of labour. SNYDER is inclined to believe that complications during labour may depress fœtal respiration.

In a further investigation SNYDER [11] studied 22 premature infants delivered by elective cæsarean section before the onset of labour. All were under 2500 g. at birth but 17 weighed between 2000 and 2450 g. Maternal diabetes was the indication for section in 4 cases. On histological examination of the lungs blood was found in the bronchi and alveoli in every case; epithelial cells and cornified cells were also present. In 11 of the 22 infants large masses of erythrocytes mixed with debris and cellular material were seen in many bronchi and alveoli. A hyaline membrane was situated round the walls of alveoli and bronchioles in the lungs of *all* infants in this series. In some areas this hyaline material was homogeneous, and in others it was mixed with erythrocytes and cellular debris. The membrane was thought to have caused obstruction to air entry, since many large portions of lung were incompletely expanded or were collapsed.

Both of these two investigations revealed a high incidence of membrane formation in infants delivered by elective cæsarean section: in 14 of the 15 full-term babies and all the premature babies membrane was found on histological examination (whereas membrane was present in only 13 of the 29 infants delivered by section after the onset of labour). SNYDER suggests that this is the result of obstruction of the air passages with blood, and that contamination of the liquor amnii at the time of incision of the uterus is the main factor in membrane formation. There is, of course, no proof that all the blood in these infants' lungs was of maternal origin. SNYDER's contention that complications of labour and asphyxia are likely to damp down fœtal respiratory movements is more debatable. It is generally accepted that a considerable amount of amniotic-sac content is likely to be aspirated if the fœtus becomes anoxic before delivery; but such aspiration is now regarded as a less likely cause of hyaline membrane than transudation from the pulmonary vascular bed.[15] LAUFE and STEVENSON [16] suggested that both mechanisms might operate, and that material aspirated into the infant's lung might potentiate the clotting of plasma-protein which had escaped from the pulmonary vessels. This view is supported by the findings of CRAIG et al.[17] These workers are convinced that the chief constituent of hyaline membrane is fibrin. When portions of lung from affected infants were injected with plasmin and then incubated, the membrane was partly dissolved and squames and

1. Potter, E. L. Pathology of the Fetus and Newborn; p. 251. Chicago, 1952.
2. Blystad, W., Landing, B. H., Smith, C. A. *Pediatrics*, 1951, **8**, 5.
3. Bloxsom, A. *Amer. J. Obstet. Gynec.* 1953, **66**, 1172.
4. Latham, E. F., Nesbitt, R. E. L., Anderson, G. W. *Bull. Johns Hopk. Hosp.* 1955, **96**, 173.
5. Soiva, K. *Acta obstet. gynæc. scand.* 1953, **32**, 422.
6. McNeill, D. B. *Amer. J. Obstet. Gynec.* 1956, **71**, 304.
7. Winter, W. D., Gellis, S. S. *Amer. J. Dis. Child.* 1954, **87**, 702.
8. Nesbitt, R. E. L., Anderson, G. W. *Obstet. Gynec.* 1956, **8**, 50.
9. Cardell, B. S. *J. Obstet. Gynæc. Brit. Emp.* 1953, **60**, 834.
10. Snyder, F. F. *Obstet. Gynec.* 1959, **14**, 267.
11. Snyder, F. F. *ibid.* p. 730.
12. Snyder, F. F. Obstetric Analgesia and Anesthesia. Philadelphia, 1949.
13. Snyder, F. F. *Obstet. Gynec.* 1958, **11**, 599.
14. Snyder, F. F. *Amer. J. Obstet. Gynec.* 1958, **75**, 1231.
15. *Lancet*, 1958, ii, 945.
16. Laufe, L. E., Stevenson, S. S. *Obstet. Gynec.* 1956, **8**, 451.
17. Craig, J. M., Fenton, K., Gitlin, D. *Pediatrics*, 1958, **22**, 847.

other debris were found in the portion of membrane which was still visible. This seems to suggest that debris from the liquor amnii may possibly act as a scaffolding on top of which fibrin and other structureless material is laid. So far the action of plasmin has been observed only in vitro. Whether it could be applied therapeutically to destroying the membrane in the live infant is unknown.

Not all agree that the incidence of hyaline membrane is higher in infants born by cæsarean section than by vaginal delivery. STRANG et al.[18] reviewed their results of cæsarean section over a period of ten years and concluded that the risk of membrane for mature babies in elective cæsarean section was small; and their results for 36 premature infants did not differ from those for all premature babies in their hospital. The suggestion that hyaline membrane is more commonly found in the infants of diabetic mothers has likewise been denied. CLAYTON[19] reported, in 201 diabetic pregnancies, hyaline membrane formation in 11% of infants delivered vaginally and in 13% delivered by cæsarean section. He concluded that the membrane formation was not clearly related to the method of delivery. Most of the neonatal deaths in his series occurred among infants delivered by section, but only because this was the commonest method used. BRUDENELL[20] also believes that the neonatal death-rate among offspring of diabetic mothers is about the same whether delivery is per vaginam or by section.

These conflicts of opinion are not easily resolved. The trouble lies partly in the difficulty of collecting a large series in any one unit and partly in the uncertainties of assessing high-risk groups from retrospective analysis of pathological material. Thus it is not known how many uneventful cæsarean sections were carried out before the total number of fatal cases reported by SNYDER were collected. At present careful clinical studies apparently indicate that there is little or no inherent risk to the infant from elective cæsarean section at or near term. Pathological investigations, on the other hand, seem to indicate that a disproportionately large number of infants with a birthweight of over 2500 g. who have died of pulmonary hyaline membrane have been delivered by cæsarean section. Some of these no doubt are infants of diabetic mothers and are not, strictly speaking, mature. The differences of opinion are probably more apparent than real.

Overriding the Parents

IMPORTANT issues of public policy are raised by the Sheffield Regional Hospital Board's new arrangements for cases where a parent refuses consent to treatment thought necessary to save his child's life. The essence of these arrangements is that an order—quickly obtained from a magistrates' court under the Children and Young Persons Act—shall place the child in the care of the local authority's children's officer, who will then give the necessary consent.

The parent's reason for withholding consent is usually that he has a conscientious objection to the proposed course of treatment. In particular, certain sects have convictions on blood-transfusion which they are prepared to uphold at all costs; and some publicity has been given to these convictions by a case in which a child died[1] and also by a television programme about an imaginary hospital. However wrongheaded such opinions appear to the great majority, we must recognise that they are deeply and sincerely held—so much so that the parents may be willing to risk the loss of the child and to face a charge of manslaughter. Most people will think it right that opinions of this kind should be overridden when there is clear risk to a child's life or health; but such a decision is not one that the community should regard lightly. It should be taken, if at all, by a judicial body. Such a body, to be effective, would sometimes have to act swiftly; and, as a means of getting a quick and reasonable decision, probably the most suitable tribunal is, as the Sheffield board believe, the local magistrates sitting as a juvenile court. Magistrates can readily be convened and have generally displayed the qualities of tact and common sense needed for comparable tasks.

Nevertheless, the Sheffield proposals are open to criticism. The Children and Young Persons Act has never, apparently, been used in the way proposed by the board, and there is some doubt whether it could lawfully be used thus. The jurisdiction under the Act depends on the child being "in need of care and protection". A child in need of care and protection is defined as one who "having a parent or guardian . . . not exercising proper care or guardianship, is neglected in a manner likely to cause him unnecessary suffering or injury to health". In describing the proposed procedure as "merely a streamlining matter",[2] the board's solicitor apparently assumed that the legal process was available. But the Act was obviously intended for quite different circumstances; and, even if it could in fact be stretched to cover cases where the parent's "neglect" is refusal of permission for particular medical or surgical treatment, this extension would surely be much less satisfactory than new legislation designed for the new purpose. In such legislation the circumstances in which the magistrates take action could be carefully defined, and there would be no need for the fiction by which the child is placed in the care of the children's officer.

The hospital board also seem to have ignored the maxim that justice must not only be done but also be seen to be done. In this kind of case it is especially important that the aggrieved parent should feel sure that his objections have been fairly dealt with by an independent tribunal. The board's arrangements could have been described in happier terms:

> "Discussions have taken place with certain of the responsible local authority and magistracy interests and a procedure has been defined where on receipt of a telephone call from a hospital concerned the children's officer would attend at the hospital on behalf of the local authority and the justices' clerk would arrange for a juvenile court to be set up at the hospital itself within the shortest possible time."

No doubt there would often be advantages in holding the court at the hospital itself, but it is for the members of

18. Strang, L. B., Anderson, G. S., Platt, G. W. *Lancet*, 1957, i, 954.
19. Clayton, S. G. *J. Obstet. Gynæc. Brit. Emp.* 1956, **63**, 532.
20. Brudenell, J. M. *Post Grad. med. J.* 1959, **35**, 564.

1. See *Lancet*, 1959, i, 584.
2. *Times*, March 15, 1960, p. 8.

the court to decide where they will sit. To give an impression that the magistrates are at the beck and call of the hospital authorities would certainly be a mistake.

Annotations

PENICILLIN HYPERSENSITIVITY

REACTIONS to penicillin [1–5] have increased in recent years, and today most severe hypersensitivity reactions and deaths are caused by this drug.[6] The increase is not surprising in view of the enormous quantity of penicillin prescribed, particularly as penicillin can cause sensitisation and provoke reactions in almost any dosage and by any route of administration. Penicillin is best avoided entirely in treating a patient who has previously had even a mild reaction, although some physicians [7] consider that if the indication for penicillin therapy is sufficiently strong—for example, in cases of syphilis or subacute bacterial endocarditis—it should be used with anti-histamines or steroids to control any sensitivity reactions. A report by Siegel [8] clearly shows that a sensitised person, even if not given penicillin therapeutically, may still encounter it in other ways and develop serious reactions.

Cow's milk nowadays may contain penicillin because milk from cows with mastitis treated with the antibiotic is often included in bulked milk supplies. In the United States 6% of milk samples and in different parts of England and Wales [9] from 5 to 47% of samples have been shown to contain penicillin; the range of penicillin concentrations in the samples was similar in the two countries. Siegel determined the oral dose of penicillin which would cause reactions in sensitised people by using their sera to produce passive sensitisation in areas of skin of normal subjects who were then given penicillin by mouth; the direct experiment of feeding penicillin to those known to be sensitised carried too great a risk of severe reactions. He found that there was enough penicillin in a glass of any of the penicillin-contaminated milks of the American survey to cause clinical reactions. This experimental evidence is supported by reports of severe dermatitis provoked by penicillin in milk [9] and of anaphylactic shock from drinking a single glass of milk.[8]

An anaphylactic reaction following an injection of testosterone in a woman known to be sensitive to penicillin led Siegel to investigate the possible contamination with penicillin of syringes previously used to inject the antibiotic: this patient was found to be very sensitive to penicillin and not at all to testosterone. All-glass syringes contaminated with penicillin were rinsed three times and boiled for fifteen minutes with the plungers in place. Penicillin was still detectable by skin tests after this procedure. When the barrel and plunger were separated before boiling, penicillin was not detected. Further, as the antigenic activity of penicillin, though reduced, was not destroyed after sixteen hours' boiling, the water in a steriliser in which syringes are boiled may contaminate clean syringes with penicillin.

A third way in which a sensitised person may accidentally encounter penicillin is by inhaling it in the air, and Siegel mentions two nurses who were unable to work in hospital wards for this reason. (Gould [10] in this country has directly demonstrated the presence of penicillin particles in the air of a hospital.)

Finally Siegel states that the amount of penicillin in Salk poliomyelitis vaccine is sufficient to cause reactions in highly sensitised people. This accords with several reports of reactions to Salk vaccine.

These hidden contacts with penicillin explain some otherwise obscure hypersensitivity reactions; and, by suggesting ways in which people who have never been treated with the antibiotic can yet be sensitised to it, they throw more light on those puzzling cases of anaphylaxis following a first injection of penicillin.

There remains the practical problem of how to detect penicillin hypersensitivity in patients requiring the drug. Undoubtedly a history of a previous reaction—however slight—is of most value. Direct skin tests [3] have a place; but these have the disadvantages, on the one hand, that they may be negative in some sensitised people and, on the other, that the patient may be so sensitive that as little as 0·000003 unit of penicillin intradermally causes a constitutional reaction.[8] Testing an area of a normal person's skin after passively sensitising it with serum from the patient is safe but too cumbersome except for research purposes. Laboratory tests for the penicillin antibody [11 12] which agglutinates penicillin-treated red blood-cells is of no assistance, because the presence of this antibody merely indicates previous contact with penicillin and not necessarily sensitisation to it. A carefully taken history and an ampoule of adrenaline always within reach seem to provide a rational approach to this possible complication.

RETINITIS PIGMENTOSA AND CONGENITAL DEAFNESS

RETINITIS pigmentosa is the classical example of a condition, at first sight unitary, which may be caused by several different mutant genes. Some affected families show the pattern given by an autosomal recessive, others that given by a dominant, and still others that given by a sex-linked recessive gene.[13] In addition, there are distinct mutant genes which cause retinitis pigmentosa in association with other abnormalities. Just over a hundred years ago, von Graefe [14] reported the association of retinitis pigmentosa and congenital deafness in 3 of a family of 5. Julia Bell,[15] in 1933 collected 93 recorded instances of this association. In 1945 Lindenov [16] confirmed that the syndrome was almost certainly due to an autosomal recessive, and showed that it was responsible for about 6% of cases of congenital deafness in Copenhagen and the adjoining counties; hence it may be inferred that the prevalence of the condition there was of the order of 3 per 100,000. Hallgren [17] has made a new study of the syndrome in Sweden, attempting to ascertain all the cases in the country. The admirable Swedish system of medical and social support for the deaf of all ages enabled him to identify 151 living patients—which probably represents the majority in the country over the age of 10, and a high proportion of those younger than this. The prevalence over the whole country was 2·4 per 100,000,

1. See *Lancet*, 1953, ii, 75.
2. *ibid.* 1954, i, 31.
3. *ibid.* 1957, ii, 929.
4. Guthe, T., Idsöe, O., Willcox, R. R. *Bull. Wld Hlth Org.* 1958, **19**, 427.
5. Willcox, R. R. *Brit. J. vener. Dis.* 1959, **35**, 208.
6. Patterson, R. *J. Amer. med. Ass.* 1960, **172**, 303.
7. Kaltz, F. *ibid.* 1957, **163**, 607.
8. Siegel, B. B. *Bull. Wld Hlth Org.* 1959, **21**, 703.
9. Vickers, H. R., Bagratuni, L., Alexander, S. *Lancet*, 1958, i, 351.
10. Gould, J. C. *ibid.* p. 489.
11. See *Lancet*. 1958, ii, 251.
12. Bird, G. W. G. *J. clin. Path.* 1960, **13**, 51.
13. Sorsby, A. Genetics in Ophthalmology. London, 1951.
14. von Graefe, A. *von Graefe's Arch. Ophthal*, 1858, **4**, 250.
15. Bell, J. The Treasury of Human Inheritance; vol. 2, p. 1. London, 1933.
16. Lindenov, H. *Op. Dom. Biol. hered. hum., Kbh.* 1945, **8**.
17. Hallgren, B. *Acta psychiat., Kbh.* 1959, **34**, suppl. 138.

which is close to Lindenov's figures for Denmark. The disorder is commoner in the more sparsely populated northern counties of Sweden than in the south. In the three most northern counties, the prevalence was found to be over 1 in 10,000; whereas in Stockholm there were only 3 cases in a population of over half a million.

Besides the two main features of the syndrome, vestibular ataxia, cataract, mental defect, and psychosis may be found. Cataract, which develops in the majority of patients over the age of 40, may be regarded as another manifestation of the gene. The majority of patients show ataxia in the form of a swinging gait; the degree of this ataxia is related to the degree of hearing loss, and Hallgren showed that it is probably due to loss of labyrinthine function. The question whether true mental deficiency is associated with the syndrome is not easily answered, because of the handicap of congenital deafness. Hallgren tried to overcome this difficulty by comparing the abilities of his patients with those of patients with congenital deafness of other types. He considered that over 20% were, to some degree, mentally retarded, but that only 2–3% were imbeciles or idiots. This does, however, suggest a real genetic association with mental deficiency. The incidence of psychosis—mainly schizophrenic-like illnesses—in the patients was also over 20%. This may reasonably be attributed to the stress of congenital deafness and the inexorably progressive loss of vision in early adult life.

Hallgren has also made a genetic analysis, which is especially valuable since it is based on much the largest consecutive series of patients. He confirms that a recessive mutant gene is the cause. The proportion affected among the sibs of propositi is close to 1 in 4: about a third of the propositi are the products of consanguineous marriages, and a sixth the product of first-cousin marriages. The frequency of the heterozygous carriers of the gene is estimated to be between 1 in 200 and 1 in 100. Genealogical investigation showed that there were ancestral connections between 30 of the 102 families. One large pedigree contained no less than 12 affected sibships.

The control of recessively determined disorders of this kind depends essentially on detection of the heterozygous carrier. Hallgren found no clinical manifestations of the gene in heterozygotes; and detection of these carriers may have to wait until the exact nature of the underlying gene-determined chemical abnormality is discovered.

IN AND BY THE COMMUNITY

THE new Mental Health Act relies largely on the expansion of community care for the mental patient. To be effective this care must be offered not only in the community but by the community. People must accept the indirect responsibility, through the agency of local authorities, of helping to develop mental-health services, and the direct, if non-statutory, responsibility of helping patients who rejoin the community as their neighbours. The Mental Health Act has become law; that it will not become practice unless people recognise that "mental health is everybody's business" is the theme of Miss Nesta Roberts' survey [1] of the Act and the community. She clears up some popular misconceptions—"patients will not surge out of the hospitals in a mighty tide, which is just as well, since hostels in which they might live cannot be conjured up immediately". She suggests how existing services may be sensibly expanded—"to take over a large, remote and probably rather damp house and staff it with a gardener-handyman and a cook-general is not to establish the kind of home that is needed". But expansion in bricks and mortar, she recognises, must wait on staff training which is even more urgent. The interval she believes can usefully be filled by intelligent propaganda among the public, and her own booklet is a brilliant start to the exercise.

1. Everybody's Business. Pp. 28. 1s. 6d. (by post 1s. 10d.) from the National Association for Mental Health, 39, Queen Anne Street, London, W.1.

LATEX AGGLUTINATION REACTION IN NON-RHEUMATIC DISEASES

WHEN certain apparently inert particles such as latex (polystyrene) are treated with human γ-globulins they become agglutinable by the sera of most patients with rheumatoid arthritis.[1] The test is approximately equal in sensitivity to the Rose-Waaler differential agglutination test (D.A.T.) but is much simpler to perform. It has gradually become apparent, however, that it lacks the specificity of the D.A.T., being positive in a wide variety of unrelated non-rheumatoid conditions.[2] A systematic study of these so-called false-positive tests has been undertaken by Dresner et al.[3 4] with most interesting results.

The sensitivity of the latex test, like that of the original D.A.T., can be greatly increased by the modification introduced by Ziff et al.[5] which detects the ability of a serum or its euglobulin fraction to inhibit a positive agglutination. Normal sera contain such an inhibitor, which is absent or much reduced in rheumatoid sera even when the agglutinating factor is itself too weak to be detected by the usual D.A.T. or latex tests. By such a latex inhibition test in place of the standard latex agglutination test, Dresner et al. increased the proportion of positive results in a series of 137 rheumatoid arthritics from 62% to 96%. Of a control group of 140 apparently healthy subjects only 7 gave positive results; all 7 had an upper respiratory viral infection. When, however, a series of patients with non-rheumatoid diseases were studied a high proportion of positive inhibition tests was found in three groups—namely, hepatocellular disease, viral infections, and syphilis. Of 96 patients with hepatocellular disease (which included portal and biliary cirrhosis as well as viral hepatitis and hepatic metastases) 68 gave a positive inhibition reaction. Furthermore, of 19 positive reactions in patients with biliary cirrhosis, 10 reverted to normal during a clinical remission. Of the 35 cases of virus infection 29 were positive. Apparently no single virus is responsible: at least eight different viruses were associated with the various illnesses in this group. The syphilitic group consisted of 19 serologically positive patients, of whom 18 gave a positive latex inhibition test, and 3 serologically negative, all of whom also gave a negative latex test. Of the remainder of the disease controls—i.e., those with non-rheumatoid diseases—only 7 out of 219 were positive.

These results indicate that the latex inhibition test is a distinct advance on the standard agglutination test since a positive result is obtained in almost every patient with rheumatoid arthritis. Previous modifications of these

1. Singer, J. M., Plotz, C. M. *Amer. J. Med.* 1956, **21**, 888.
2. Howell, D. S., Pike, R., Malcolm, J. M. *Arthritis and Rheumatism*, 1959, **2**, 63.
3. Dresner, E., Trombly, P. *New Engl. J. Med.* 1959, **261**, 981.
4. Dresner, E., Trombly, P., O'Brien, G. F. *Clin. Res.* 1959, **7**, 49.
5. Ziff, M., Brown, P., Lospalluto, J., Badin, J., McEwen, C. *Amer. J. Med.* 1956, **20**, 500.

the court to decide where they will sit. To give an impression that the magistrates are at the beck and call of the hospital authorities would certainly be a mistake.

Annotations

PENICILLIN HYPERSENSITIVITY

REACTIONS to penicillin [1–5] have increased in recent years, and today most severe hypersensitivity reactions and deaths are caused by this drug.[6] The increase is not surprising in view of the enormous quantity of penicillin prescribed, particularly as penicillin can cause sensitisation and provoke reactions in almost any dosage and by any route of administration. Penicillin is best avoided entirely in treating a patient who has previously had even a mild reaction, although some physicians [7] consider that if the indication for penicillin therapy is sufficiently strong—for example, in cases of syphilis or subacute bacterial endocarditis—it should be used with anti-histamines or steroids to control any sensitivity reactions. A report by Siegel [8] clearly shows that a sensitised person, even if not given penicillin therapeutically, may still encounter it in other ways and develop serious reactions.

Cow's milk nowadays may contain penicillin because milk from cows with mastitis treated with the antibiotic is often included in bulked milk supplies. In the United States 6% of milk samples and in different parts of England and Wales [9] from 5 to 47% of samples have been shown to contain penicillin; the range of penicillin concentrations in the samples was similar in the two countries. Siegel determined the oral dose of penicillin which would cause reactions in sensitised people by using their sera to produce passive sensitisation in areas of skin of normal subjects who were then given penicillin by mouth; the direct experiment of feeding penicillin to those known to be sensitised carried too great a risk of severe reactions. He found that there was enough penicillin in a glass of any of the penicillin-contaminated milks of the American survey to cause clinical reactions. This experimental evidence is supported by reports of severe dermatitis provoked by penicillin in milk [9] and of anaphylactic shock from drinking a single glass of milk.[8]

An anaphylactic reaction following an injection of testosterone in a woman known to be sensitive to penicillin led Siegel to investigate the possible contamination with penicillin of syringes previously used to inject the antibiotic: this patient was found to be very sensitive to penicillin and not at all to testosterone. All-glass syringes contaminated with penicillin were rinsed three times and boiled for fifteen minutes with the plungers in place. Penicillin was still detectable by skin tests after this procedure. When the barrel and plunger were separated before boiling, penicillin was not detected. Further, as the antigenic activity of penicillin, though reduced, was not destroyed after sixteen hours' boiling, the water in a steriliser in which syringes are boiled may contaminate clean syringes with penicillin.

A third way in which a sensitised person may accidentally encounter penicillin is by inhaling it in the air, and Siegel mentions two nurses who were unable to work in hospital wards for this reason. (Gould [10] in this country has directly demonstrated the presence of penicillin particles in the air of a hospital.)

Finally Siegel states that the amount of penicillin in Salk poliomyelitis vaccine is sufficient to cause reactions in highly sensitised people. This accords with several reports of reactions to Salk vaccine.

These hidden contacts with penicillin explain some otherwise obscure hypersensitivity reactions; and, by suggesting ways in which people who have never been treated with the antibiotic can yet be sensitised to it, they throw more light on those puzzling cases of anaphylaxis following a first injection of penicillin.

There remains the practical problem of how to detect penicillin hypersensitivity in patients requiring the drug. Undoubtedly a history of a previous reaction—however slight—is of most value. Direct skin tests [3] have a place; but these have the disadvantages, on the one hand, that they may be negative in some sensitised people and, on the other, that the patient may be so sensitive that as little as 0·000003 unit of penicillin intradermally causes a constitutional reaction.[8] Testing an area of a normal person's skin after passively sensitising it with serum from the patient is safe but too cumbersome except for research purposes. Laboratory tests for the penicillin antibody [11 12] which agglutinates penicillin-treated red blood-cells is of no assistance, because the presence of this antibody merely indicates previous contact with penicillin and not necessarily sensitisation to it. A carefully taken history and an ampoule of adrenaline always within reach seem to provide a rational approach to this possible complication.

RETINITIS PIGMENTOSA AND CONGENITAL DEAFNESS

RETINITIS pigmentosa is the classical example of a condition, at first sight unitary, which may be caused by several different mutant genes. Some affected families show the pattern given by an autosomal recessive, others that given by a dominant, and still others that given by a sex-linked recessive gene.[13] In addition, there are distinct mutant genes which cause retinitis pigmentosa in association with other abnormalities. Just over a hundred years ago, von Graefe [14] reported the association of retinitis pigmentosa and congenital deafness in 3 of a family of 5. Julia Bell,[15] in 1933 collected 93 recorded instances of this association. In 1945 Lindenov [16] confirmed that the syndrome was almost certainly due to an autosomal recessive, and showed that it was responsible for about 6% of cases of congenital deafness in Copenhagen and the adjoining counties; hence it may be inferred that the prevalence of the condition there was of the order of 3 per 100,000. Hallgren [17] has made a new study of the syndrome in Sweden, attempting to ascertain all the cases in the country. The admirable Swedish system of medical and social support for the deaf of all ages enabled him to identify 151 living patients—which probably represents the majority in the country over the age of 10, and a high proportion of those younger than this. The prevalence over the whole country was 2·4 per 100,000,

1. See *Lancet*, 1953, ii, 75.
2. *ibid.* 1954, i, 31.
3. *ibid.* 1957, ii, 929.
4. Guthe, T., Idsöe, O., Willcox, R. R. *Bull. Wld Hlth Org.* 1958, **19**, 427.
5. Willcox, R. R. *Brit. J. vener. Dis.* 1959, **35**, 208.
6. Patterson, R. *J. Amer. med. Ass.* 1960, **172**, 303.
7. Kaltz, F. *ibid.* 1957, **163**, 607.
8. Siegel, B. B. *Bull. Wld Hlth Org.* 1959, **21**, 703.
9. Vickers, H. R., Bagratuni, L., Alexander, S. *Lancet*, 1958, i, 351.
10. Gould, J. C. *ibid.* p. 489.
11. See *Lancet*. 1958, ii, 251.
12. Bird, G. W. G. *J. clin. Path.* 1960, **13**, 51.
13. Sorsby, A. Genetics in Ophthalmology. London, 1951.
14. von Graefe, A. *von Graefe's Arch. Ophthal*, 1858, **4**, 250.
15. Bell, J. The Treasury of Human Inheritance; vol. 2, p. 1. London, 1933.
16. Lindenov, H. *Op. Dom. Biol. hered. hum., Kbh.* 1945, **8**.
17. Hallgren, B. *Acta psychiat., Kbh.* 1959, **34**, suppl. 138.

which is close to Lindenov's figures for Denmark. The disorder is commoner in the more sparsely populated northern counties of Sweden than in the south. In the three most northern counties, the prevalence was found to be over 1 in 10,000; whereas in Stöckholm there were only 3 cases in a population of over half a million.

Besides the two main features of the syndrome, vestibular ataxia, cataract, mental defect, and psychosis may be found. Cataract, which develops in the majority of patients over the age of 40, may be regarded as another manifestation of the gene. The majority of patients show ataxia in the form of a swinging gait; the degree of this ataxia is related to the degree of hearing loss, and Hallgren showed that it is probably due to loss of labyrinthine function. The question whether true mental deficiency is associated with the syndrome is not easily answered, because of the handicap of congenital deafness. Hallgren tried to overcome this difficulty by comparing the abilities of his patients with those of patients with congenital deafness of other types. He considered that over 20% were, to some degree, mentally retarded, but that only 2–3% were imbeciles or idiots. This does, however, suggest a real genetic association with mental deficiency. The incidence of psychosis—mainly schizophrenic-like illnesses—in the patients was also over 20%. This may reasonably be attributed to the stress of congenital deafness and the inexorably progressive loss of vision in early adult life.

Hallgren has also made a genetic analysis, which is especially valuable since it is based on much the largest consecutive series of patients. He confirms that a recessive mutant gene is the cause. The proportion affected among the sibs of propositi is close to 1 in 4: about a third of the propositi are the products of consanguineous marriages, and a sixth the product of first-cousin marriages. The frequency of the heterozygous carriers of the gene is estimated to be between 1 in 200 and 1 in 100. Genealogical investigation showed that there were ancestral connections between 30 of the 102 families. One large pedigree contained no less than 12 affected sibships.

The control of recessively determined disorders of this kind depends essentially on detection of the heterozygous carrier. Hallgren found no clinical manifestations of the gene in heterozygotes; and detection of these carriers may have to wait until the exact nature of the underlying gene-determined chemical abnormality is discovered.

IN AND BY THE COMMUNITY

THE new Mental Health Act relies largely on the expansion of community care for the mental patient. To be effective this care must be offered not only in the community but by the community. People must accept the indirect responsibility, through the agency of local authorities, of helping to develop mental-health services, and the direct, if non-statutory, responsibility of helping patients who rejoin the community as their neighbours. The Mental Health Act has become law; that it will not become practice unless people recognise that "mental health is everybody's business" is the theme of Miss Nesta Roberts' survey [1] of the Act and the community. She clears up some popular misconceptions—"patients will not surge out of the hospitals in a mighty tide, which is just as well, since hostels in which they might live cannot be conjured up immediately". She suggests how existing services may be sensibly expanded—"to take over a large, remote and probably rather damp house and staff it with a gardener-handyman and a cook-general is not to establish the kind of home that is needed". But expansion in bricks and mortar, she recognises, must wait on staff training which is even more urgent. The interval she believes can usefully be filled by intelligent propaganda among the public, and her own booklet is a brilliant start to the exercise.

1. Everybody's Business. Pp. 28. 1s. 6d. (by post 1s. 10d.) from the National Association for Mental Health, 39, Queen Anne Street, London, W.1.

LATEX AGGLUTINATION REACTION IN NON-RHEUMATIC DISEASES

WHEN certain apparently inert particles such as latex (polystyrene) are treated with human γ-globulins they become agglutinable by the sera of most patients with rheumatoid arthritis.[1] The test is approximately equal in sensitivity to the Rose-Waaler differential agglutination test (D.A.T.) but is much simpler to perform. It has gradually become apparent, however, that it lacks the specificity of the D.A.T., being positive in a wide variety of unrelated non-rheumatoid conditions.[2] A systematic study of these so-called false-positive tests has been undertaken by Dresner et al.[3 4] with most interesting results.

The sensitivity of the latex test, like that of the original D.A.T., can be greatly increased by the modification introduced by Ziff et al.[5] which detects the ability of a serum or its euglobulin fraction to inhibit a positive agglutination. Normal sera contain such an inhibitor, which is absent or much reduced in rheumatoid sera even when the agglutinating factor is itself too weak to be detected by the usual D.A.T. or latex tests. By such a latex inhibition test in place of the standard latex agglutination test, Dresner et al. increased the proportion of positive results in a series of 137 rheumatoid arthritics from 62% to 96%. Of a control group of 140 apparently healthy subjects only 7 gave positive results; all 7 had an upper respiratory viral infection. When, however, a series of patients with non-rheumatoid diseases were studied a high proportion of positive inhibition tests was found in three groups—namely, hepatocellular disease, viral infections, and syphilis. Of 96 patients with hepatocellular disease (which included portal and biliary cirrhosis as well as viral hepatitis and hepatic metastases) 68 gave a positive inhibition reaction. Furthermore, of 19 positive reactions in patients with biliary cirrhosis, 10 reverted to normal during a clinical remission. Of the 35 cases of virus infection 29 were positive. Apparently no single virus is responsible: at least eight different viruses were associated with the various illnesses in this group. The syphilitic group consisted of 19 serologically positive patients, of whom 18 gave a positive latex inhibition test, and 3 serologically negative, all of whom also gave a negative latex test. Of the remainder of the disease controls—i.e., those with non-rheumatoid diseases—only 7 out of 219 were positive.

These results indicate that the latex inhibition test is a distinct advance on the standard agglutination test since a positive result is obtained in almost every patient with rheumatoid arthritis. Previous modifications of these

1. Singer, J. M., Plotz, C. M. *Amer. J. Med.* 1956, **21**, 888.
2. Howell, D. S., Pike, R., Malcolm, J. M. *Arthritis and Rheumatism*, 1959, **2**, 63.
3. Dresner, E., Trombly, P. *New Engl. J. Med.* 1959, **261**, 981.
4. Dresner, E., Trombly, P., O'Brien, G. F. *Clin. Res.* 1959, **7**, 49.
5. Ziff, M., Brown, P., Lospalluto, J., Badin, J., McEwen, C. *Amer. J. Med.* 1956, **20**, 500.

serological tests for the rheumatoid factor have almost invariably been associated with a corresponding loss in specificity, and the present modification is no exception. But inclusion by Dresner et al. of a wide range of controls has shown that this loss in specificity does not greatly impair the value of the test, since the vast majority of the false-positive results belong to three distinct groups of diseases which should only rarely lead to confusion with rheumatoid arthritis. Moreover, the positive results in these non-rheumatoid states may themselves prove of considerable diagnostic value.

Dresner's findings emphasise once again the fundamental difference between the factors responsible for latex agglutination and the agglutination of red blood-cells sensitised with amboceptor. Whereas in hepatic disease, viral infections, and syphilis the latex inhibition test is commonly positive, the D.A.T. is almost invariably negative. It seems that the true rheumatoid factor has a wider range of specificity with regard to the modified γ-globulins with which it can react than the agglutinating factors found in other diseases.

GENETICS OF SCHIZOPHRENIA

No-one can seriously doubt the importance of genetic factors in schizophrenia, but their mode of action is still undecided. Twin studies have shown that the concordance-rate for monozygous twins is much greater (76–86%) than in dizygous twins (14%),[1 2] and this is clear evidence that heredity [3] plays a part. Kallman [2] has found that the consanguinity-rate among parents of schizophrenics (5·7%) is much higher than in the general population (others have found much smaller increases [4 5]); and this might seem to be good evidence for Kallman's hypothesis that schizophrenia is inherited through a recessive autosomal gene. Closer examination does not justify this assumption.[6] Using Dahlberg's formula to calculate gene frequency of schizophrenia in the general population, it is necessary to suppose that there are some 125 distinct autosomal genes. That this is extremely unlikely is shown by the high rate of schizophrenia in the children of two schizophrenic parents (who would not be likely to have the same genes if schizophrenia were due to 125 different ones). Furthermore the fact that the rate of schizophrenia is no lower or is slightly higher in the children (16·4%) than in the siblings (14·3%) points strongly to transmission by a dominant gene. Böök,[4] in his study of an isolated North Swedish community, postulates a dominant gene of incomplete penetrance; but this is a very unusual group, and Böök's results may not be applicable to schizophrenia elsewhere. A dominant gene explains many of the findings, but not all unless additional assumptions are made. Slater [7] has suggested that transmission may be by a gene intermediate between dominant and recessive.

Hallgren and Sjögren,[8] in an exhaustive genetico-statistical population study of a type that the Swedish have made peculiarly their own, have found an association between schizophrenia and mental deficiency. There were significantly more mental defectives among schizophrenic propositi but not among siblings; and there was no increase of schizophrenia in the siblings of defective propositi. Hallgren and Sjögren conclude that an explanation cannot be found on the basis of their material, but that this does not support the assumption that abnormalities classified as mental deficiency are manifestations of early schizophrenic deterioration. An association between schizophrenia and mental deficiency has also been found by Böök [4] (although the results were not statistically significant) and by Slater [9] who, in a study of maternal uncle-nephew relationships, tentatively suggested that a sex-linked recessive gene might be responsible.

Rosenthal,[10] by an ingenious analysis of Slater's twin series, has investigated the possibility that, while some cases are genetically determined, others are not. He compares the monozygous twins concordant for schizophrenia with those discordant, reasoning that, if some schizophrenia is genetically determined and some not, the former should be found predominantly in the concordant twins and the latter in the discordant. That schizophrenia is almost totally absent in the families of the discordant pairs and present in about 60% of the families of the concordant seems to support the hypothesis. The male affected discordant twins (females were less predictable) tended to have a better premorbid adjustment than the concordant twins (though adjustment was poor in both groups), and the illness was more often paranoid, whereas in the concordants it was commonly catatonic. Environmental factors, then, seem to be more important in the ætiology of the paranoid form of schizophrenia.

The basis of schizophrenia remains undecided, but it seems likely to be heterogeneous: in some cases (probably among the paranoids) environmental factors are of much importance; but in most, genetic factors predominate. Even if heredity plays a great part in schizophrenia, this does not necessarily mean that the cause is some inherited anomaly (Kety [11] has pointed out that in tuberculosis, judged by contingency and twin studies, constitution is only slightly less important than in schizophrenia); but such a defect does seem probable.

SNAKEBITE IN U.S.A.

With less than 1000 bites a year and a fatality-rate under 2%, snakebite is not a serious medical problem in the U.S.A. Rattlesnakes are the only important cause of envenomation. They belong to the family of crotalidæ or pit vipers (the pit, between the eye and nostril, is a thermosensitive organ for self-protection and for detecting prey), examples of which are found in America, India, and elsewhere in Asia. Rattlesnakes, so-called because of their unique tail adaptation which rattles when the snake is disturbed, are confined to the American continent. In a review of bites in south California Russell [12] mentions the importance of early administration of antivenene (but not the fact that this is largely beyond the doctor's control) and advocates injection by local, intramuscular, and intravenous routes. He does not recommend antihistamines and steroids except for serum reactions. Although blood-transfusions were given to 5 out of 15 patients, their value is not assessed. Reid [13] has claimed that in severe envenomation following Asian viper-bites adequate blood-transfusion is the most important therapeutic agent.

1. Slater, E. Psychotic and Neurotic Illnesses in Twins. *Spec. Rep. Ser. med. Res. Coun., Lond.* 1953, no. 278.
2. Kallman, F. J. *Amer. J. Psychiat.* 1946, **103**, 309.
3. Slater, E. *J. ment. Sci.* 1953, **99**, 44.
4. Böök, J. A. *Acta genet.* 1953, **4**, 1.
5. Larson, T., Sjögren, T. *Acta psychiat. neurol. scand.* 1954, suppl. 89.
6. Slater, E. Clinical Genetics (edited by A. Sorsby); p. 332. London, 1953.
7. Slater, E. *Acta genet.* 1958, **8**, 50.
8. Hallgren, B., Sjögren, T. *Acta psychiat. neurol. scand.* 1959, suppl. 140.
9. Slater, E. *Acta genet.* 1953, **4**, 273.
10. Rosenthal, D. *J. nerv. ment. Dis.* 1959, **129**, 1.
11. Kety, S. S. *Science*, 1959, **129**, 1528.
12. Russell, F. E. *Amer. J. med. Sci.* 1960, **239**, 1.
13. Reid, H. A. *Brit. med. J.* 1957, ii, 942.

Medical Education

PRECLINICAL BIOCHEMISTRY

A View from London Bridge

ARNOLD H. SCHEIN*
B.S., Ph.D.
ASSOCIATE PROFESSOR OF BIOCHEMISTRY,
UNIVERSITY OF VERMONT COLLEGE OF MEDICINE,
BURLINGTON, VERMONT, U.S.A.†

THE unrest and ferment in all phases of medical education in the United States are impressive. Much of the pressure for change stems from broad agreement that now, more than ever, lines of demarcation between erstwhile preclinical disciplines are fading. The belief is widely held that old teaching practices cannot cope with the explosion in scientific and medical knowledge. Care, money, and valuable time are lavished upon educational programmes designed to improve teaching and learning. It is de rigueur for medical schools of any reputation to have at least one teaching " experiment " under way. After more than a decade of vigorous experimentation, proof is lacking that returns are even remotely proportional to investment; real achievement is hampered by lack of adequate controls and objective criteria for judging the success of altered curricula and teaching methods. Yet it is recognised that grave problems exist, and an attempt is being made to solve them. Nothing ventured, nothing gained.

My principal aims in going to London were to assess the role of biochemistry and to see something of British developments in medical education. Discussions with heads of departments, and other teachers, at each of the ten London medical schools offering the 2nd M.B., as well as my own teaching experiences, observations, and impressions gathered over an academic year, provide the basis for this article.

Pedagogically attractive aspects of London medical education (and of biochemistry) which could be profitably emulated in the United States—including a superior scale for grading students, excellent intradepartmental correlation, the external examiner system, chemical pathology, and the relaxed mien of the students—will be elaborated upon in a separate article designed for American colleagues. Here I shall concentrate rather upon those aspects of London medical biochemistry which in my opinion could be significantly improved. Many of my statements and inferences will be considered too sweeping, or inconsistent with the experiences of other interested observers, particularly those with a domestic frame of reference. If so, they must gather whatever wheat they may find among the chaff. My suggestions are not original, and many of them have been made at one time or another by London colleagues. Nor have I any wish to suggest that London weaknesses are unique. Similar deficiencies, particularly in the realm of staff, interdepartmental correlation, and laboratory teaching prevail in the United States to a marked degree.

BIOCHEMISTRY AND ANATOMY

A strong case can be made for reasonable emphasis on biochemistry in light of the contributions of this science to current advances in medicine. In the United States, biochemistry was many years ago advanced to essentially equal status with gross anatomy. In London, however, anatomy is by far the major subject of the preclinical curriculum and biochemistry is a minor subject.

The following paraphrased comments from British colleagues aptly describe the situation:

" The trouble is not with the British students, but with the archaic system of giving priority to anatomy in our teaching. Whatever the time-table says, a great majority of our students apportion their time as follows: counting total for a week = 10, anatomy = 7, physiology = 2, biochemistry = 1. Some may use 6 : 3 : 1, or a few even 5 : 4 : 1, but it is a tragic fact that biochemistry remains about 1.

" There are several reasons for this: (a) A tradition which goes back to the time when anatomy was the only preclinical subject. (b) The fear of dire consequences inculcated in the hearts of all medical students if anatomy is not mastered. Too often the implication is that anatomy is the *only* important subject of the curriculum and the rest is best forgotten. (c) The fact that the great emphasis on anatomy is upheld by the college and university administration and by nearly all the clinical teachers. (d) The fortnightly anatomy vivas. There is no counterpart of these vivas in biochemistry or physiology.

" As a result of all this the young students are completely duped into really believing that anatomy is of vast and major importance, and far more so than the rest of their studies. The whole system is woeful, tragic, and about forty years out of date."

I can bear out these observations.

Thus, the outstanding difference between London and United States medical biochemistry is that in the former biochemistry—despite adequate hours, course content, and competent staffs—is not taken seriously by the students as a valuable foundation for medicine. The chief reason for their indifference is the overwhelming emphasis upon anatomy, which dominates their thoughts, interests, and study time. As a consequence, parallel studies are neglected to a greater or lesser degree. There is a distinct reluctance to commit valuable and necessarily limited brain-space to biochemistry at the expense of anatomy. The student lives from one anatomy viva to the next. A talented note-taker, he does not *listen* to lectures or read biochemistry. Students comprehend little of the subject matter or significance of lectures and practical work at the time of presentation. Lecture notes may be revised and studied *just before* trial examinations. The London student's capacity for cramming is impressive.

The concepts of biochemistry, to a large extent, rest one upon the other. If crammed, these concepts cannot be assimilated and then integrated to form a framework for that aspect of human biology known as medicine. Failure to grasp biochemical principles results in failure to apply them adequately in the recognition and treatment of disease.

A single, but perhaps representative, opposing view of a senior London anatomist is summarised:

1. Anatomists are all medically qualified and therefore better able to determine the needs of medical students. It is true that sound anatomical training is by far the most useful of all studies for general practitioners.
2. Proper dissection of the whole body and thorough knowledge of structure is time-consuming and demanding. Any compromise of this fact will erode the foundations of medical education. Also existing regulations require the dissection of the whole human body. (The last statement is no longer true.)
3. Students use anatomy as an excuse for not doing well in other subjects, and other disciplines make anatomy the scapegoat for their own inadequacies.
4. Teaching anatomists are unaware of demands by clinicians for more emphasis on biochemistry in the curriculum; indeed it has been the other way around—with the demand for more thorough training in anatomy.

* Exchange senior lecturer, 1956-57: department of biochemistry, The Medical College of St. Bartholomew's Hospital, London.
† Aided by a grant from the National Science Foundation.

5. Medical students now receive satisfactory anatomy training—not too much, not too little. Anatomy has already been extensively shortened—no more cutting can be justified. If it is true that students neglect their physiological sciences in favour of anatomy, it would be desirable to lengthen the preclinical interval and devote a few trimesters exclusively to the other preclinical subjects.

Point 3 has more than a grain of truth. Point 4, to my surprise, seemed to be substantiated by my own experiences and by contacts and conversations with clinicians, clinical teachers, and practitioners in London. This is in marked contrast to the plea by clinical acquaintances in the United States for greater emphasis on *physiological sciences* during preclinical *and* clinical years.

I am not competent to discuss whether London students are "overeducated" in anatomy. However, a teaching system which for almost two years suffers students' neglect of one, and perhaps two, of the fundamental basic sciences cannot be said to lay a proper foundation for the practice of modern medicine.

The situation is completely recognised by nearly all the preclinical staff (other than anatomy), and pressures are being exerted to modify the curriculum. A strong case for judicious pruning of anatomy in Great Britain has recently appeared.[1] It is perhaps significant that the recent report of the General Medical Council, in its recommendations (which are deemed to have the force of regulations) on dissection of the human body, fails for the first time to include the word *whole*.[2] In the past, strict and literal interpretation of this word has proved a stumbling-block to equal priority for physiology and biochemistry.

Pedagogic devices such as tutorials, increasing the instructor's time with students, increasing instructor/student ratio, printed study questions, written assignments, and insistence on class attendance are futile if students will not make an effort to learn biochemistry. The students are not to blame. They simply respond understandably to more immediate and overt pressures.

Significant improvement in London biochemistry may have to wait until anatomy is somewhat deflated and biochemistry is recognised by students and clinical staff as a major subject. The London medical student has yet to be convinced that the understanding and application of biochemical principles is necessary for the practice of good medicine, and only clinicians who are so convinced can change his attitude. This was the lesson learnt in the United States when a similar situation with regard to anatomy prevailed. Clinicians, and not preclinical instructors, set the mode. If the medically qualified clinical teachers respect and utilise the scientific aspects of medicine the message will reach even preclinical students.

STUDENTS

It is admirable that almost all London students enjoy tuition and living grants, and that no worthy person who survives the rigorous British academic elimination contest is denied medical education on economic grounds. Also creditable is the lack of a geographic basis for student selection. In the United States, residence restrictions (many State-supported universities do not accept applicants from outside their own State) and the high cost of medical education are factors which tend to lower the quality of medical students. London students are $2^1/_2$ to 4 years younger and less mature than their American counterparts. However, British general educational background is superior, except in science.

The London medical student outwardly exhibits a rather carefree, nonchalant attitude and a steadfast determination not to be overwhelmed by work—the result, it is claimed, of his intensive, somewhat monastic, premedical schooling. The university offers release to academic and living freedom, and it is understandable that at first he takes advantage of this heady new environment. In contrast to a large proportion of medical students in the United States, only a few London preclinical students are burdened with the blessings (?) of matrimony and parenthood.

Because British secondary education lays stress on command of the written word, the London student's examination answers are, compared to those of his American counterpart, prose masterpieces. One can hardly overstate this difference in skill of written communication. In class discussion, however, the Londoner tends to be tongue-tied and shy. He is terribly afraid of making an ass of himself or showing off. It is evident that his inhibited performance is confined to the classroom, since informal social meetings, flavoured by suitable liquid refreshment, reveal him to possess a positive talent for oral expression. He is likely to be fluent on all topics other than those connected with his studies.

FACULTY

As in the United States, instructors are likely to regard teaching as a necessary chore, and occasionally as a nuisance. This latter attitude, based on competition for research versus teaching time, and in London upon the general lack of student interest in biochemistry, is unfortunately shared in reverse by a large number of students. The atmosphere is not conducive to development of teaching enthusiasm, and in such an environment learning rarely flourishes. Some London biochemistry instructors, vitally concerned with education of medical students, make mighty efforts to breach the solid wall of student apathy, but these are essentially futile.

With few exceptions members of the teaching staff avidly pursue their research interests. Only senior members are bogged down with committees and administrative duties. The primary task of the younger man is research, and new personnel are selected more for their research potential and productivity than for discernible aptitude or interest in teaching. The same criteria to a large extent guide financial reward and promotion.

Teaching versus research recognition is an endlessly debated subject in American universities. In London as elsewhere an undercurrent of dissatisfaction with the system of rewards was evident. The competition between teaching and research time is a real one, and, since the teaching of medical students demands scholarship of a high order, rewards and incentives should not be withheld from the man who is creative primarily in the classroom.

In only half the schools visited did I find any demonstrable curiosity about the teaching of biochemistry in the United States. Some teachers were frankly envious of the stimulating biochemistry teaching climate there; others felt it to be a terrible drag on research; and one, while decrying London biochemistry, felt (with some justification) that the emphasis on biochemistry in the United States might be as misplaced as the emphasis on anatomy in England. At one school the entire staff gathered to interrogate the visitor; the experience was highly stimulating and mutually informative.

1. Black, D. *J. med. Educ.* 1957, **32**, 751.
2. General Medical Council. Recommendations as to the Medical Curriculum, 1957.

CONTENT OF BIOCHEMISTRY COURSE

A substantial number of lecture and practical hours at many schools were devoted to organic chemistry.[3] Retention of this subject in the already swollen preclinical curriculum is an anachronism. Organic chemistry should be transferred to the school or 1st M.B. period. Some medical colleges have effected changes to this end, but not completely. After the study of the chemistry of carbon compounds, the subject-matter of the biochemistry course is quite similar in London and in the United States.[4] Some London departments omitted a topic or two, some blended topics (e.g., metabolism and vitamins) and some, like many American departments, left acid-base, water balance, and endocrinology to physiology.

In almost all London schools preclinical biochemistry is supplemented by formal consideration of "abnormal" biochemistry (chemical pathology) during clinical years. Preclinical biochemistry is university-oriented rather than clinically oriented. This is ideal in theory; clinical teachers may expand upon the previously established foundation of "normal" biochemistry. The ideal is perhaps only remotely realised in practice, for, though it may seem wise to delay discussion of abnormal biochemistry until clinical material is at hand, the biochemistry foundation of the London medical student—quite noticeably shaky at any time—may have crumbled and vanished very soon after his 2nd M.B. The base upon which abnormal biochemistry should rest is likely to be non-existent.

In the United States, some chemical pathology is incorporated into preclinical biochemistry. Perhaps as a consequence, there seems to be little doubt in the students' mind of the importance of biochemistry in medicine. In addition, the concepts of genetic, metabolic, and structural abnormality are developed as vistas broaden throughout the preclinical and clinical years. This development is also a feature of London medical education.

Teachers of biochemistry may well consider the advisability of widening the scope of their interests, reading, research, and teaching in the area of biochemical abnormality. Without going overboard, this step would aid in motivating students and in bridging the very wide gap between preclinical and clinical studies. To the same end, chemical pathologists may be invited to participate in the latter part of the biochemistry course. Such a programme has already been instituted in at least one school, and has been found a desirable adjunct to the teaching of biochemistry.

TEXTBOOKS

The London student relies mainly on lecture notes. Only half of the departments urge students to buy a textbook. The most popular are Thorpe's *Biochemistry for Medical Students* and Bell, Davidson, and Scarborough's *Textbook of Physiology and Biochemistry*. There are no reading assignments nor do students make any effort to read subjects in advance of lectures.

Some of the teaching personnel were acquainted with the encyclopædic American textbooks of biochemistry, many were not. Despite their generally favourable impressions, few thought that students should acquire any of these books. The opinion was expressed that they are too detailed, high-powered, and expensive. The most telling argument was that "the students won't read them". The texts were in fact considered equivalent to works of reference, suitable for preparation of lectures by staff.

TUTORIALS

About half of the schools scheduled tutorials. Unless written papers were demanded, few students prepared for these conferences. Attendance was inclined to fall off gradually as the term advanced, except at tutorials supervised by the professor. The London student, like his American counterpart, is nobody's fool; he knows who grades the final examination.

PRACTICAL WORK

London medical students, relatively deficient in science background, lack appreciation of quantitation. Perhaps that is why their practical work is geared mainly to qualitative examination of biological materials. The student is deluged with qualitative tests, in which he has little interest, the importance of which is not clear to him, and which he usually does in a slipshod fashion. Students approach practical work as a chore to be muddled through; and this they do with remarkably good humour and grace. Practical work is seldom prepared for in advance. "Cooking" is the order of the day except for one session—the practical examination of the 2nd M.B.—where the students work industriously and intensively; the contrast between examination and daily laboratory work is startling.

Some experiments demand a quantitative approach; but the opportunity to emphasise the meaning of significant figures, the value of at least duplicate determinations and concepts of precision and accuracy is seldom fully seized. As medicine progresses towards its status as a true science, requirements for more exact measurement will also increase. Emphasis in practicals may well be placed on quantitative procedures, the results of which lend themselves to a discussion of biological changes from a quantitative as well as a qualitative standpoint.

It is also valuable for future physicians to study the biology of the whole mammal whenever possible. This recommendation was capable of engendering fierce controversy among both students and staff. The counter argument usually conceded the educational benefits, but moral objections were raised against use of small mammals (mice, rats, guineapigs, rabbits) for student practical work—even though the only operative procedures suggested on the unanesthetised animal were subcutaneous injections and bleeding from tail or ear veins. Where such objections prevail—and perhaps in any case—the medical student is himself the best experimental subject. A considerable number of practical experiments in the biochemistry laboratory employing man are feasible, and indeed desirable. Curiously enough, few people objected to this: they simply shuddered at the imagined consequences.

Many of these desiderata may be combined in fewer but *better* experiments by students. Some schools included a fair sprinkling of practical exercises of this type. The list could be profitably expanded.[5]

Some instructors fraternise with students, but only a few try to discuss the work in progress during practicals; the general rule seems to be to let the student alone—a practice which the student heartily favours. Indeed, students are likely to be shocked or pained if pointed questions about practical procedure or theory are directed at them. Thus the opportunity to use some of the practical time for intimate teaching is little grasped. Rather, the student races to finish his quota of experiments, and interruptions are unwelcome. Tradition favours the students' point of view.

Practical data are treated by the schools in various ways. At many schools students check out at the end of a period; the check-out consists of a few moments devoted to inspection of each student's data by an instructor and a question or two, after which the student signs the attendance sheet. Also, and depending upon the nature of the data, individual results may be

3. Report on Undergraduate Medical Education in Great Britain and Northern Ireland (August, 1957). Part III. The Preclinical Curriculum. P. 17 (table II).
4. First Teaching Institute: the Teaching of Physiology, Biochemistry and Pharmacology. *J. med. Educ.* 1954, **29**, 114 (table 10c).
5. *ibid.* p. 115 (table 10d, special experiments).

tabulated upon the blackboard. These may form the basis for a short class discussion by the instructor either at the end of the day or at the beginning of the following period. Students may also be instructed to copy the tabulated class data and to draw their own conclusions. One school utilised tutorials for discussion of practical results.

The individual though necessarily brief check-out has merit, but it should be possible to derive greater benefit from the many long hours spent in practical work. If the significance of this work is not brought home to the student within a reasonable time, these hours are essentially wasted. With other irons in the fire, he is unlikely himself to draw full and correct conclusions from practical work. When the subject is fresh, an hour or so at the end of a practical may be profitably spent discussing class results. Individual failure to obtain correct results, errors, and frequency distributions clearly emerge when all class results are compared. Students may thus get the benefit of the work performed by the entire class. At least one school has started exactly such a system.

" Cooking " should certainly be abolished. There is an understandable reluctance to move against this widespread practice by harassing students with counterparts of anatomy vivas. Yet to start practical work without the foggiest notion of the scheduled experiments and their implications is a travesty of laboratory work: it is a serious waste of the time alike of student and staff. Perhaps better utilisation of practical time can be achieved by having individual teachers spend ten minutes or so with each student every other practical day, during regular practical hours. Informal ungraded oral questions on the significance of experiments in progress may be the keynote of these brief discussions. A few sessions will readily convince students that it is advisable to prepare for practical work. Such intimate teaching may be continued throughout the year and thus afford an opportunity for the students to advance their own questions without inhibition. Each student may be helped to appreciate the state of his knowledge. The sessions may also be useful in evaluating students, and the instructor's impressions should be considered in the final student grade.

EXAMINATION AND EXAMINATION SYSTEM

Although the all-important 2nd M.B. in biochemistry is comprehensive in scope it is not without shortcomings. Students enjoy wide latitude in their choice of questions, enabling them to get by with very incomplete demonstration of the breadth of their knowledge. The questions themselves tend to place a premium on cramming; for what is demanded, more than anything else, is simple recall of lectures, rather than utilisation of knowledge. This is not the case with the practical examination.

Up to 40% of the marks may be earned by selecting questions on material commonly covered in introductory organic chemistry. Despite convenience and tradition, it does seem out of place to ask students, who are ready to start clinical work, how to distinguish primary from secondary and tertiary amines. The medical student's memory burden is sufficiently heavy without adding organic straw at the wrong time. This point has been made before.

The practical examination of the 2nd M.B. achieves several desirable ends. It provides incentive to carry out the assigned experiments during the course. It confronts students with problems of logic, makes them organise their biochemical knowledge, and tests their ability to solve scientific problems with mind and hand. In fact it is the prototype of what the written theory paper of the 2nd M.B. *should be*. But the proportion of the final student grade in biochemistry given for this single laboratory examination ($^1/_3$) seems somewhat excessive.

Slight adjustment of total biochemistry marks, reflecting the student's performance in trial examinations, may be made if the 2nd M.B. examination result is borderline. There is also more than a hint that a few schools will display a positive bias in these cases if overall weekly laboratory performance has been satisfactory.

Theoretically, a student may fail biochemistry proper and still earn a pass in physiology. Such cases are said to be rare. If the failure is flagrant, the professor of biochemistry has the option of insisting upon student repetition of the entire 2nd M.B. examination.

It was wonderfully refreshing to find an examination system as yet uncontaminated by the injudicious use of the so-called objective or short-answer question, an abomination of American education wherein the written equivalent of a grunt serves to gain or lose marks.

TEACHERS AND EXAMINERS

The examination system points up a marked difference, not apparent to superficial observation, in the role of the London compared with the United States teacher. In the United States the teacher also examines. He may be, and should be, somewhat uneasy in his dual role; to a certain extent, the student's examination grade reflects the instructor's success or failure, since lecture notes are frequently regurgitated at examination, with only slight alterations, and the teacher can hardly criticise or fail himself. In the United States the preclinical medical student is self-tyrannised by the fear of failing if he by word or act creates an unfavourable impression upon his teachers. It does not matter that the basis for this fear is largely illusory. Aware that he is under the continual scrutiny of people who one day will be called to sit in judgment, the student is inclined to be distrustful and reserved in his dealings with teachers.

The external examiner system avoids such a relationship at the university level and at the same time ensures fairness and uniform standards. Under this system the internal staff are teachers; but with the exception of the professor, they do not examine. Students are more likely to respect and trust their advisers, rather than grimly contemplate a future game of wits (examination) in which the stakes will be exceedingly high and one-sided. The contrast between the relaxed London medical student compared with the tense and over-anxious American student has already been mentioned.

The disadvantages of the external examiner system are that the instructors who do most of the teaching, and who are best able to assess students, have little or nothing to say about student grades. Also the imposition of uniformity acts as a brake against desirable as well as undesirable innovations in fashioning examinations. A professor who wished to drop organic questions from the 2nd M.B. examination complained that he was prevented from doing so by the external examiner. Some modification of the disadvantages may be sought, but admittedly it is difficult to reconcile the desirability of having an instructor function only as a coach and at the same time grant him a voice in awarding final marks.

INTERDEPARTMENTAL CORRELATION

Whereas intradepartmental correlation left nothing to be desired (the result perhaps of daily tea, wherein departmental, college, national, and international problems are solved), over half the schools had no interdepartmental correlation plan of any kind. Informal arrangements settling the sequence of common topics (i.e., respiration, digestion) among departments were considered examples of correlation. Where any measure of correlation was observed it was between the departments of physiology

and biochemistry, seldom with anatomy. One school, an outstanding exception, integrated biochemistry with all the basic sciences and (even) with clinical subjects.

For the most part, there is little social or academic contact or mixing between junior personnel of biochemistry and the medical staff. This represents a real loss of opportunity for correlation, self-education, and exchange of ideas.

That British medical educators are well aware of the desirability of interdepartmental correlation is evident from the recommendations of the General Medical Council: "Every effort should be made to secure close correlation in the teaching of anatomy, physiology and biochemistry and to stress, wherever opportune the importance of these subjects in their clinical application." [2] The correlation plan of the school cited above could well serve as a model for others anxious to gain the advantage of integration of preclinical subjects. Since there is no distinct division between the biology of the normal and the abnormal, opportunities for the basic-science teacher such as attendance and participation in the London equivalent of clinical-pathological conferences, grand rounds medical conferences, and serving as consultants in cases of metabolic disease should prove stimulating and at the same time furnish a basis for motivating students.

COMPARISON

I am guilty of generalisations; and generalisations, like rules of grammar, are proved by their exceptions. Not all London students were indifferent to biochemistry. Indeed the top students somehow managed to regulate their interests and study time so that the physiological sciences were not altogether slighted. These same students tried to keep up with all their studies. They were motivated not by fear but by intellectual curiosity. It was particularly gratifying to work with such students; they represent the best of both educational systems.

In my opinion the United States has clear advantages in that the importance of biochemistry for medical studies is recognised by clinicians and students. American students are also older, better prepared in science, less casual, more industrious at the preclinical level, and, in their pursuit of knowledge, harder to discourage.

Despite these advantages the success of instruction in biochemistry at home leaves no room for complacency. A poll of various groups of physicians in the United States revealed that, whereas they thought that a "good knowledge of biochemistry was important to the good practice of medicine" their preclinical biochemistry course only very indifferently helped them in their practice of medicine. Despite the unanimous respect and emphasis accorded to biochemistry in the United States, it is far from being the handmaiden of medicine.[6]

I wish to thank the many colleagues who have graciously commented upon certain sections of the manuscript. Disagreement with many points was evident and not unexpected. All opinions and interpretations are entirely my responsibility.

6. *ibid.* p. 107 (table 2).

Points of View

CORPORAL PUNISHMENT

J. A. WAYCOTT
M.B. Cantab., M.R.C.P., D.C.H.
BARRISTER-AT-LAW

"I can imagine nothing more repugnant to the most elementary principles of justice and common sense than to say that, because a man has committed a savage offence, those whose duty it is to enforce respect for the law should begin that man's punishment with correspondingly savage treatment."

THESE words were spoken by Lord Oxford sixty years ago. The present agitation for the restoration of corporal punishment is a sad commentary on 20th-century progress. Based as it is on fear and ignorance, it takes little account of the hard fact that all the available evidence is firmly against the view that the cat or birch are effective instruments of penal reform.

Knowledge of violently antisocial persons has increased considerably in recent years. As our ideas of criminal responsibility alter, so it becomes necessary to make fundamental changes in the methods of dealing with some of those convicted of serious crime. Also it is becoming easier to assess the results of various penal methods and to compare their effectiveness as means of protecting the public interest. From this knowledge has emerged in rather stark outline a fact that is exceedingly inconvenient. "To make the punishment fit the crime" is no longer a rational object. It is becoming increasingly obvious that often we must make the punishment fit the criminal. In the present state of public understanding this must give rise to considerable anxiety. When the figures of those convicted of violent crime are a source of further anxiety it is not surprising that there should be a reaction in the direction of retributive punishments.

A further difficulty arises from the fact that the interests of the offender and of the public are often in conflict. The ancient struggle between reform and deterrence is, to some degree, reenacted when the sentence to be imposed on an individual offender is determined. What may be in his best interest may not serve the community best. Statistics must ever remain silent upon one of the most important results of a sentence—namely, the effect it has upon potential imitators. Those who commit the same offence a second or third time, and others who copy because they think they can get away with it, all come within the statistical net. But we know nothing of those who might have committed certain offences but for the exemplary punishment of their acquaintances. Notting Hill comes to mind in this connection. In considering the arguments relating to corporal punishment this difficulty is fundamental. Because of the total absence of evidence, it cannot be weighed nicely. Herein lies one of the sources of the unfortunate differences that have divided honest and sincere advocates of corporal punishment from those who are opposed to it.

MAGISTERIAL OPINION

Of course it is true to say that statistics themselves can accurately reflect the united feelings of judges and magistrates. It is beyond belief that these feelings should have failed to take account of the difficult question of deterrence. At the beginning of the present century there were 3385 birchings ordered by the juvenile courts. By 1936 this had fallen to 166. At this time a Departmental Committee on Corporal Punishment [1] was set up "to consider the question of corporal punishment in the penal systems of England and Wales and of Scotland; to review the law and practice relating to the use of this method of punishment by Juvenile Courts, by other courts and as a penalty for certain offences committed by prisoners; and to report what changes are necessary or desirable".

1. Cmd 5684. H.M. Stationery Office, 1938.

In 1948 the great Criminal Justice Act was passed. It is a landmark in our legal history, and among other provisions it gave effect to the committee's recommendations. It is therefore worth examining these a little more closely.

The dramatic decline in the number of birchings was explicable only on the grounds that the majority of juvenile courts had entirely abandoned this method because they found in practice that it was ineffective as a means of treating young offenders. Neither could it be shown to have any deterrent quality. The busier and more experienced courts had given up corporal punishment altogether. The only courts still using it were "in country districts or in the smaller towns". The juvenile courts in London and in many of the larger towns had not made any use of their powers to order corporal punishment "in recent years". These facts become extremely interesting when considered in relation to the present feeling among some magistrates for a return to corporal punishment. In January, 1953, a referendum was held among members of the Magistrates Association. They were asked to reply to the question "Are you in favour of corporal punishment for crimes of violence?" Those answering "Yes" numbered 4412 and those saying "No" were 1886. The membership at the time was 9451. In *The Magistrate* last October,[2] a doctor who is on the juvenile bench declared that he was "completely convinced that corporal punishment must return", and added that he would "like to commence a movement or even an agitation for its return". In the January issue of this year [3] another correspondent boldly announced his suggestion of "six of the best administered publicly over a form in the Market Place by a Police *Woman* in uniform". (Italics original.) Thus the wheel comes the full circle—almost.

WHAT IT ENTAILS

It is possible, of course, that not everyone who advocates corporal punishment is fully aware of what it entails. If it were to bear even a passing resemblance to the kind of punishment administered by parent or schoolmaster it might have something to commend it. But it differs in several important particulars.

A youngster dealt with in this way by parent or master receives his punishment shortly after commission of the offence. Between punisher and punished there are bonds of respect and affection. These continue afterwards in the supervision and care that such persons in authority exercise. The punishment itself is not administered in circumstance of extreme humiliation and indignity.

When carried out by order of the court things were very different. In the first place there was an inevitable delay between the commission of the offence and the passing of the sentence. The order of the court was carried out by an officer whose relation with the offender was not likely to be coloured by mutual respect, still less affection. It was regarded as essential to identify those individuals who would undoubtedly be harmed or made even more antisocial by such treatment. This involved psychological assessment, which was occasionally, and on other grounds, neither necessary nor desirable. Practice varied a little from one area to another but in general the description in the Cadogan report [1] was acknowledged to be accurate. Those who wish to see these things revived must be quite sure they understand what they are asking for, and for this reason it is worth quoting the words of the report:

"The punishment is usually administered in a cell or private room either within the precincts of the court or at a neighbouring police station. The birch is applied across the buttocks on the bare flesh. The method most commonly adopted is to bend the boy over a low bench or table. His hands, and sometimes his feet also, are held by police officers. This is done in order to ensure that he shall not move, for if he moved a stroke of the birch might fall on some more sensitive part of the body. This method, though probably the most common, is not universal. In some Police Forces one constable takes the boy on his back, drawing the boy's hands down over his shoulders; another constable holds the boy's feet, drawing his legs round the sides of the first constable; the first constable then leans forward, and the birch is applied by a third. We have also heard that in one Police Force the custom is for one constable to bend the boy over and hold his head between his knees, while a second officer administers the birch. And in one district the boy is strapped to an apparatus similar to the triangle used for corporal punishment in prisons."

For these and other reasons the committee concluded that "as a court penalty, corporal punishment is not an effective method of dealing with young offenders. We do not regard it as a suitable penalty for serious cases: these require constructive methods of treatment, designed to deal with the causes and conditions underlying the offence, and corporal punishment is essentially non-constructive".

DIAGNOSIS

What then is the alternative? It will be remembered that the Criminal Justice Act made provisions for the setting up of detention centres. The white-paper on Penal Practice in a Changing Society [4] proposed an extension of the scope of punitive detention. A recent Home Office circular [5] has given the preliminary results of Dr. Max Grünhut's research into the effects of detention in detention centres. (Dr. Grünhut is reader in criminology at the University of Oxford.) From this it appears that this method of treatment is suitable for "boys with a more or less substantial criminality not due to deep-rooted personal factors or seriously adverse home conditions, for whom detention is the first experience of any form of institutional treatment". It will be recognised at once that these are just the offenders who might be thought suitable for corporal punishment. No-one has ever seriously suggested that psychologically abnormal individuals or those with particularly bad home conditions should be whipped. They, and the mentally subnormal and psychopathic offenders, cannot reasonably be subjected to violent punishment in an attempt to get them to mend their ways. Those who are most likely to be thought of as candidates for birching are the very individuals for whom the detention centre is most effective. A comparison of the results of detention centre and birching leaves little room for doubt that the former is preferable.

The first need, in dealing constructively with violent offenders is accurate diagnosis. As a Medical Correspondent in *The Times* [6] has pointed out, there are several groups into which they can be fitted even in the present state of knowledge. The proper treatment of them depends to some extent upon the category in which they are placed. Some will doubtless have to be dealt with by removing them from society for a prolonged period, perhaps indefinitely. Provisions contained in the Mental Health Act, soon to become law, will have an important influence. The development of units for the treatment of psychopaths, on the lines of the one at the Belmont

2. *Magistrate*, 1959, **15**, 113.
3. *ibid.* 1960, **16**, 5.
4. Cmnd 645. H.M. Stationery Office, 1959.
5. CRI 216 1/55.
6. *Times*, Jan. 27, 1960.

Hospital, may define some of the limits in this exceptionally difficult field. The probation system will be closely involved with a certain number.

Legislative reforms must have a considerable public opinion behind them. Unhappily it is also true that general agitation has, on occasions in the past, been the mainspring of retrograde and panic measures. To bring back corporal punishment now, despite all the evidence we have, would be to acknowledge that, in some cases at least, motives of revenge must be given priority. It is inconceivable that this could serve the interests of the country.

Special Articles

AN EASIER ALPHABET?

S. L. PUGMIRE
L.R.C.P.I., D.P.M.
SENIOR HOSPITAL MEDICAL OFFICER, WHITTINGHAM HOSPITAL, PRESTON

THE competition for a phonetic alphabet called for in George Bernard Shaw's will brought almost 500 entries, but the panel of judges felt that none merited final adoption. My own entry was one of four chosen for further consideration. It is based on the principles of information theory, and uses six binary units of information for each letter.

I first became interested in this approach to problems of communication while doing research at Rampton State Hospital. Some patients had had 14 years' tuition since leaving school and still could neither read nor write. The high correlation between antisocial conduct and illiteracy is well known and its cause not hard to find, for our modern society is cruel to the illiterate, especially the child. Whatever the cause of his handicap (which may be a specific disability), he is liable to hear himself described as lazy, stupid, subnormal, defective, or feebleminded. He is continually reminded of his disability, often blamed, and all too often ridiculed. If a few show dislike for their literate neighbours and develop an aggressive reaction toward society, this is not hard to understand. What *is* difficult to understand is why people who can think and transmit their thoughts easily in speech are unable to transmit the same messages in writing.

I decided to assess the difference in irrelevant information content of the spoken and written language.

Spoken

The ten commonest words (*the, of, and, to, a, in, that, it, is,* and *I*) cover about a quarter of the words in everyday use. I examined them to see how far they could be shortened before they lost their identity. In full they total 19 sounds and when reduced to (*the, o, a, t, a, i, tha, it, is, I*) only 13. These 13 are essential to identity and 6 are irrelevant, giving about 46% redundancy. As these common words seemed shorter than the average, I repeated the exercise with 75% of words in general use starting with the letter A. Their approximate frequency per 1000 words is given in parentheses: *and* (32), *a* (21), *as* (8), *at* (6), *are* (5), *all* (4), *an* (3), *any* (2), *about* (1), *after* (1), *am* (0·7). They total 26 sounds of which 17 are essential to identity and 9 irrelevant, giving a redundancy of 53%.

Written

In the written language 26 letters inadequately cover 40 phonemes (vowel or consonant sounds). Each letter has at least four forms—written and printed, capital and small. There is much redundancy in spelling. For instance, the long and short sounds *i* each has 20 modes of formation, while the *sh* sound has at least 17.

Lastly, many letters contain others within themselves, which is a form of redundancy. Thus one does not know whether N or M is being written until the third curve is reached.

There is thus much more redundancy in written than in spoken language (about fifty times as much), and this may well be a cause of illiteracy.

To confirm this I asked groups of patients to sort packs of cards, say black and white, from random order into two piles—i.e., for one unit of information. Then for two or three units of information into respectively four and eight piles. Cards were identified by distinctive colours or shapes or sizes or combinations of these. Information was always handled at a uniform rate as in a binary digital computor, regardless of the form in which it was presented.

Some intelligent yet illiterate patients showed an interesting disorder. When asked to sort cards into piles of characteristic shapes and colours—say red squares, red triangles, blue squares, and blue triangles—they proceeded at a normal speed; but when asked to disregard the colours and sort only by shape—say, squares and triangles—they could not do the task. They continued as before, sorting into four piles using all information available and could not separate the message (the shapes) from the irrelevant information (the colours). More complex tests confirmed that their brains were functioning like a radio set with no tuning device. When one station only was on the air, the radio worked perfectly; but when two stations came on together the set picked up both messages at once and was unable to suppress one message while receiving the other.

This finding suggested that for patients of this type a new alphabet should carry no unnecessary information. An alphabet in which each letter carried 6 (and only 6) units of information (the minimum possible for 40 letters) would prove most satisfactory. To reduce phonemes to 40, minor differences in vowel sounds (as in *but* and *burr*, *bat* and *bare*, *feud* and *futility*, *art* and *artistic*) had to be ignored.

SOME PRINCIPLES AND THEIR APPLICATION

Before beginning to design a simplified alphabet I decided that it must meet the following needs:

1. Extreme simplicity.
2. Mathematical utility.
3. High writing speed.
4. Economy in space, paper, and ink.
5. Suitability for typing.
6. High reading speed.
7. Adaptability for use in other languages.
8. Accurate transcription of defective script.
9. Letter forms suited to hand movements.
10. Suitability for mechanical reading.

I took a short straight vertical line, as the clearest and most compact letter to write, and added information unit by unit:

1st unit.—It can be written on or through the line

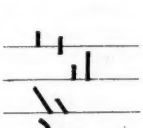
2nd unit.—It can be short or long

3rd unit.—It can be inclined to the right or left

4th unit.—It can be made concave to the left

5th unit.—It can be made concave to the right

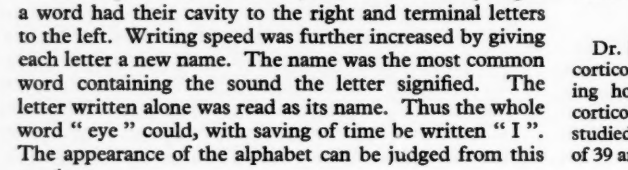
6th unit.—It can be inclined 90° or not



The later units tended to be less compact and slower to write; so the commonest sounds were attached to the simplest letters. They could be joined or not as

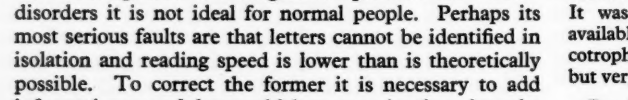
desired; but, to prevent possible confusion, junctional lines were always written upwards and letters downwards. Straight lines were vowels and bent ones consonants; short lines were short vowels, longer lines long vowels.

Such simple rules were not only easy to learn but made for clarity even when the writing was poor. To emphasise the clear space between words, letters that usually began a word had their cavity to the right and terminal letters to the left. Writing speed was further increased by giving each letter a new name. The name was the most common word containing the sound the letter signified. The letter written alone was read as its name. Thus the whole word " eye " could, with saving of time be written " I ". The appearance of the alphabet can be judged from this specimen:


If it is to be generally adopted
a new alphabet must be simple
clear and of attractive appearance
easy to learn and a great deal faster
to write than the traditional one.

SOME DEFECTS

As this alphabet was designed for patients with mental disorders it is not ideal for normal people. Perhaps its most serious faults are that letters cannot be identified in isolation and reading speed is lower than is theoretically possible. To correct the former it is necessary to add information to each letter which must seriously reduce the writing speed. Raising the reading speed is equally baffling because people read by totally different processes. Some slow readers sound out the letters, *c-a-t*, while fast readers often identify a whole group of words by their contour. This method can be effectively demonstrated by trying to read the story of the little girl and her magic dog printed in this form:



Letters of different lengths provide good contour effects but are often slow to write. The ideal probably lies between 3 or 4 lengths which respectively provide 6 and 10 alternative contours. Any final alphabet will result from weighing the advantages against the disadvantages of each change in letter form.

The designers of the four alphabets which were commended in the competition have been asked to cooperate in an attempt to produce a final " Shaw Alphabet " free from major defects. Whatever the result, it can only be an improvement on our present orthographic system. Bernard Shaw must have longed for a phonetic script when writing Miss Dolittle's part in *Pygmalion*, as she slowly changed her accents from that of one section of British society to another. When asked about the subject he usually emphasised the saving in money, paper, and ink. Books could be a third the size and half the price. Children would have no spellings to learn, could write faster and read fluently at a much earlier age. The annual saving, he once estimated, would equal the cost of the 1914–18 war. Perhaps he thought financial advantages were the only ones that would interest us, for he once wrote: "England knows nothing of phonetics, hates education but will do anything for money."

Conference

CORTICOTROPHIN

AT the University of Sheffield on Jan. 7 and 8, 30 research-workers and clinicians, from several disciplines, met to discuss the adrenocorticotrophic hormone. There follows an abstract of the proceedings.

Structure and Assay of Corticotrophins

Dr. H. B. F. DIXON (Cambridge) described the structure of corticotrophins and their relation to the melanophore stimulating hormones (M.S.H.). Only the most abundant form of corticotrophin that can be extracted from pituitaries has been studied in any detail. It is a polypeptide consisting of a chain of 39 aminoacids the sequence of which is known for the bovine form. It has a sequence of 9 aminoacids in common with M.S.H., which may explain the mild M.S.H. activity of corticotrophin. Dr. Dixon outlined the little that was known relating their structures to their functions, and speculated that M.S.H. must have some function in mammals, otherwise the physiologically active mutant forms would not have survived.

In the discussion it was pointed out that there was no agreed nomenclature for corticotrophins and that recommendations were at present being considered by the International Pharmacopeial Commission. It was thought that the corticotrophin preparations now available for clinical use contained approximately 50% corticotrophin A and other unknown substances, including protein, but very little M.S.H. activity.

Dr. M. STACK-DUNNE (Medical Research Council, Hampstead) discussed the biological assay of corticotrophin. Measurement of adrenal ascorbic-acid depletion after subcutaneous injection of corticotrophin in hypophysectomised rats was the only practical and reliable means of assaying corticotrophin for *clinical* use. The assay of corticosteroid synthesis in adrenal slices (Saffran and Schally) had the same limitations as the intravenous Sayers assay (adrenal ascorbic-acid depletion). The present 2nd international standard was not suitable for comparison with present-day purified corticotrophin. Until the 3rd standard became available each manufacturer was using an approved " house standard ". Dr. STACK-DUNNE said he would be happier about the uniformity of potency of corticotrophins for clinical use when these standards were replaced by a new (3rd) international standard. He made a plea that users of corticotrophin inform him at once if they suspect that any batch of corticotrophin is not up to expected strength. He pointed out that it had been learnt recently, and was not generally known, that gelatin preparations should be kept at or below 50°F.

Dr. W. J. TINDALL said that *zinc* preparations must *not* be refrigerated. Dr. H. F. WEST (Sheffield) spoke of the assay of total 17-hydroxycorticosteroids (17(OH)C.S.) in urine for measuring the effectiveness of corticotrophin therapy. If the effectiveness depended upon the adrenal output of cortisol then the assay was sufficiently accurate and an indispensable guide—with two reservations: (1) that no condition existed in which 11 or 21 hydroxylation of the corticosteroid molecule was defective (e.g., the adrenogenital syndromes or the administration of substances such as SU 4885); and (2) that there may be states in which the proportion of cortisol metabolised to 17(OH)C.S. was abnormal. Dr. P. S. DAVIS (West London Hospital) produced evidence suggesting that such an abnormality was seen sometimes in rheumatoid arthritis. If the effectiveness of corticotrophin therapy depended on the concentration of diffusible cortisol in the blood, Dr. WEST suggested that the measurement of free cortisol in the urine might prove a more reliable guide than the assay for 17(OH)C.S.

Dr. J. K. NORYMBERSKI (Sheffield) said that using the published method for the estimation of total 17(OH)C.S. a figure of 2 mg. or less was meaningless. Dr. S. SHUSTER (Cardiff) had

found a low excretion of 17(OH)C.S. in patients with wasting from chronic diseases, which was in keeping with their addisonian-like appearance, but their blood-levels of 17(OH)C.S. were either normal or raised. He wondered whether they had the altered metabolism of cortisol that is seen during pregnancy. Dr. C. L. COPE (Hammersmith) had found that the adrenal output of cortisol, measured isotopically, confirmed West's assumption that the 17(OH)C.S. assay was a reliable guide to cortisol production—but *only* when the turnover was large. At physiological levels his figures and those for the 17(OH)C.S. excretion did not correlate.

Corticotrophin and Aldosterone

Dr. BERTHA SINGER (Sheffield) discussed the possible relation of corticotrophin to aldosterone secretion. She described the effects on adrenal aldosterone secretion in rats subjected to various experimental procedures and emphasised the difficulties encountered in their interpretation. She favoured the view that when corticotrophin caused an increased secretion of aldosterone, as during salt restriction, the effect was not a direct one on the adrenal glomerulosa zone. She also favoured the hypothesis that the delta-1 corticotrophin fraction of Bell stimulated aldosterone secretion because it was contaminated with a diencephalic or pineal hormone that Farrell had named "glomerulotrophin". There was general agreement with these views and much speculation as to why corticotrophin did not stimulate aldosterone secretion. Current theories of the biosynthesis of corticosteroids suggest that it should. A possible explanation suggested by Dr. J. F. TAIT (Worcester Foundation) was that the glomerulosa zone did not bind corticotrophins as the reticularis and fasciculata zones did. Dr. STACK-DUNNE maintained that corticotrophin did affect the glomerulosa zone since he and Cater had found a fall in the mitotic activity after hypophysectomy that could be restored by corticotrophin administration.

Dr. E. ROSS (University College Hospital) found a brisk increase in aldosterone excretion following salt deprivation in the recently hypophysectomised patient but little response in the patient with hypopituitarism of long standing. The part that growth hormone might play in these circumstances was discussed.

Dr. STACK-DUNNE had not found growth hormone (bovine) to affect the rat adrenal glomerulosa zone, but Dr. SINGER had some years ago found an increased secretion of aldosterone after growth hormone and Dr. Venning had recently confirmed this with improved assay techniques.

Dr. J. G. PHILLIPS spoke of the marked adrenal activity in the salmon during its run from the sea to the freshwater spawning grounds, and mentioned the fact that it has no separate glomerulosa zone for aldosterone-secreting cells.

Effects of Corticotrophin on Adrenal Cortex

Prof. T. SYMINGTON (Glasgow) and Dr. J. K. GRANT (Edinburgh) described work, done in collaboration, on the effects of corticotrophin stimulation on the histological appearances, the enzyme activities, and the steroid biosynthesis of the adrenal cortex in vivo and in vitro. The work on the human adrenal in vivo was done in collaboration with Mr. A. P. M. FORREST (Glasgow).

Professor SYMINGTON said that after stress or corticotrophin therapy the lipid-laden cells of the fasciculata zone changed to cells packed with mitochondria rich in enzymes of the Kreb's cycle. R.N.A. became abundant in the cytoplasm and both zones looked alike. These changes were associated with an increased responsiveness to corticotrophin and a marked increase of hydrocortisone secretion relative to corticosterone. The adrenal in this state was "primed".

Dr. GRANT criticially reviewed the theories so far put forward on the site of action of corticotrophin, and then described some of his own studies on the action of corticotrophins on the enzymes of the adrenal cortex in man. He had found that, in vivo, corticotrophin increased the 11-beta-hydroxylase activity of the mitochondria of the fasciculata and reticularis cells and the 17-and 21-hydroxylase activity of their cytoplasm. Hydrocortisone secretion was increased markedly and corticosterone secretion increased little, or even fell. He thought that the 11 and 17 hydroxylations were increased relative to the 21 and wondered how this could be if corticotrophin produced its effect by making reduced triphosphopyridine nucleotide (T.P.N.H.) available, since all three systems were activated by T.P.N.H.

The meeting discussed whether there was a factor that "primes" adrenals, as distinct from producing steroid synthesis. The adrenals of Cushing's syndrome patients were considered to be so primed. Dr. BERYL DAVIES (Imperial Cancer Research Fund Laboratories) said that she had found the blood concentration of corticotrophin in 2 such patients to be 2 to 3 times the normal level (0·8 milli-units per 100 ml.). The significance of the loss of lipid during stimulation of the adrenal cortex was discussed. In vitro the lipid-laden adrenal slice can produce more steroid than the lipid-depleted slice, but it was thought that this did not mean that the lipid-depleted adrenal in vivo was less efficient, or exhausted, since it would have substrate for synthesis continually arriving in the bloodstream. Dr. GRANT pointed out that of the many mammals studied the ruminants all had adrenals made up of compact cells (except the golden hamster) whereas all other mammals studied had adrenals packed with lipid-laden cells—in the resting state. No explanation for this marked difference was forthcoming.

Resistance to Corticotrophin

Dr. WEST described studies on the resistance to exogenous (intramuscular) corticotrophin therapy, acquired by some patients, which necessitated a manyfold increase in dose in order to maintain the same clinical effects and excretion daily of 17(OH)C.S. in the urine. His evidence suggested that where resistance developed to high doses the cause was likely to be antibody formation (as in some cases of insulin resistance), but where resistance was mild it might be interpreted as due to variation in the normal corticotrophin degradation process, about which nothing was known. In one patient marked resistance developed, even to a highly purified porcine corticotrophin A1. He thought that their failure so far to demonstrate serum-antibodies to purified corticotrophin was due to the technical difficulties of labelling corticotrophin with ^{131}I. The discussion raised the following points: resistance was not confined to patients with rheumatic diseases; the incidence of acquired resistance developing over 6–12 months was approximately 1 in 6; changing the site of injection did not affect the resistance. One of the difficulties encountered in studying the resistance was the fact that a sufficiently raised level of circulating cortisol would overcome the resistance.

Corticotrophin in Diagnosis

Prof. G. M. WILSON (Sheffield) had found corticotrophin of particular value in excluding Addison's disease in patients who had become cachectic from an alimentary disorder. In his experience corticotrophin tests after prolonged exogenous corticosteroid therapy revealed a great variability in adrenocortical responsiveness which he was at a loss to explain.

Dr. K. FOTHERBY (Edinburgh) said that in testing adrenal function we should not forget that in urine there are metabolites of adrenal origin other than the 17(OH)C.S.—dehydroepiandrosterone and pregnanediol, for instance. Dr. WEST spoke of the unexplained patient-to-patient differences in the ketosteroid/17-ketogenic-steroid (17-K.S./17-K.G.S.) ratio during corticotrophin therapy. Dr. V. H. T. JAMES said that at St. Mary's Hospital a number of hirsute women had been seen whose 17-K.S. excretion rose excessively in relation to the 17-K.G.S. rise during corticotrophin tests. The 17-K.S. fraction responsible for the rise was not always the same. The substance SU4885 was discussed. Dr. GRANT had found that it arrested 11-beta-hydroxylation in the adrenal mitochondria but that it did not adversely affect liver mitochondria.

Treatment of Pulmonary Tuberculosis and Rheumatoid Arthritis

Dr. L. E. HOUGHTON (Harefield) had used high initial doses of corticosteroids or corticotrophin to suppress the tissue response to the infection and to suppress any hypersensitivity reaction to streptomycin or P.A.S. Both short-term and long-term (3-8 years) effects were excellent. Guineapigs given cortisone during B.C.G. immunisation developed a better protection against live tubercle bacilli than those given B.C.G. alone. He thought this was due to the cortisone prolonging the antigenic stimulus and not adversely affecting the immunity response.

Dr. DAVIS compared long-term corticotrophin and oral corticosteroid therapy in the treatment of rheumatoid arthritis. From a comparison of objective data corticotrophin was found to be superior to cortisone and at least as effective as prednisolone. The data from serial radiographs were the most impressive. Withdrawal of corticotrophin was less difficult than the withdrawal of oral corticosteroids. Of side-effects less peptic ulceration was associated with corticotrophin but more hypertension and androgenic effects.

Differences between Corticosteroid and Corticotrophin Therapy

Dr. WEST emphasised the chief differences, especially the fact that corticosteroid therapy suppresses the adrenal androgen whereas corticotrophin increases its secretion. He invited explanations of the observation that rheumatoid arthritics soon adapt to cortisone therapy but do not so adapt to corticotrophin therapy. One reason why corticotrophin therapy did not induce peptic ulceration (in his patients) was because they did not need to put aspirin into their empty stomachs in order to get going early in the morning. He was very impressed by the severity of the bruising seen in rheumatoid patients after some years of exogenous corticosteroid therapy. His preliminary findings were that corticotrophin-treated patients were not similarly affected. Dr. SHUSTER said that this bruising or purpura was due to atrophy of collagen, as in senile skin, which allowed the layers to slip one across the other and tear capillaries. Corticosteroid treatment also caused a delay in the resolution of the extravasated blood.

Dr. COPE said that among physicians throughout the world there was a feeling that corticotrophin therapy was in some way better than oral corticosteroid therapy. He thought that the increased secretion of androgens might be relevant.

Dr. F. PAULSEN (Malmö) referred to a study in Denmark that showed that there was far less osteoporosis with corticotrophin therapy; he thought this, too, might be explained by the androgen factor. Dr. JAMES thought the new anabolic agents might prevent the catabolic effects of corticosteroids. Dr. WEST found, in wasted rheumatoid arthritic patients, that prolonged treatment with the non-virilising nortestosterones caused a striking increase in creatinine excretion but no obvious increase in muscle mass or strength. There was considerable discussion of the problem of corticosteroid withdrawal and it was agreed that more knowledge was needed of the means for forestalling and treating iatrogenic pituitary-adrenal insufficiency.

Summing up, Prof. C. H. STUART-HARRIS drew attention to the value, once more apparent, of discussion between scientists and clinicians working in related fields. The integration of biochemical, morphological, and physiological findings had been valuable, and mind sparking on mind had stimulated fresh ideas for the solution of the many unanswered questions. He was impressed by the example the rheumatologists set in attempting to measure the effects of corticotrophin from the time of its introduction, and, although it was a side-issue in the conference, he hoped that a plea would go forth from the conference for a concerted effort to solve the problem of pituitary-adrenal unresponsiveness following corticosteroid therapy.

In England Now

A Running Commentary by Peripatetic Correspondents

YOU must be prepared to play an entirely passive role with those who have made illness their business. However busy the surgery, at whatever stress to your internal workings, you must first and foremost be pleased to see them. You then sit back easily, but not too comfortably, for fear of sleep, and incline the listening ear.

"Yesterday evening I was standing by the back door, just coming back from the toilet as a matter of fact; they are terribly old houses, and time and time again we've asked to have one inside, but you might as well ask for the moon. Anyway, it suddenly came over me, that awful feeling right here in the middle of my stomach, and it shot straight up, like a flash of lightning, and out of the top of my head. Luckily Mr. Thompson was in the kitchen at the time and heard me cry out, or I'd have gone down. Of course I knew it was my liver again. I was trembling for a good hour afterwards. Mr. Thompson had to get his own supper; I couldn't have faced the smell. Mr. Thompson, he's not at all well himself, doctor; he said to me, 'Ada,' he said, 'first thing in the morning, you go down to the doctor and get a bottle of your medicine'."

If you tell these patients that there is nothing the matter with them, they will be really hurt, and justifiably so as their symptoms are real enough, and must have a hearing. They will take their story elsewhere, and the rest of the family will leave you en bloc, and possibly half the street as well. Anyway, on the rare occasion, when mutual confidence has been established, the cause of the neurosis may be suddenly dropped in your lap.

"If my husband were only different. The night our Ken was killed, he went out and got drunk. The police brought him home, and all the neighbours watching. Next day he shut me up when I started to speak. Then he's a good bit older than me too. It's queer to explain, he was never much for married life even before, but after that, well, there hasn't been anything."

Do not break new ground by altering the treatment. The usual bottle is best. Separate symptoms cannot be obliterated by recent drugs. Such methods may have a rapid rebound.

"I'm sorry to get you out so late, doctor, but I've felt that funny all evening. If I shut my eyes, I can feel my head floating away. I just took the first of those new shiny tablets when I got back from the surgery. I couldn't have got up to the surgery, doctor, I wouldn't have dared. Been on the go all night. My husband said could it be those torpedo things you gave me?"

Referring them to hospital is seldom helpful.

"Oh, they were certainly very thorough down at the hospital, doctor. First a young chap comes along and asks me about all the illnesses I have had, right back from my being little. He was writing away for ages. Then there was a bit where we was at cross-purposes, as it were, me telling him about that trouble Dad had down below, and him thinking it was me. Then he had me in a little room stripped off, and he went over me from top to bottom, as you might say. He left me standing there just as I was for quite a bit, while he went away. Then back he came with a big dark fellow with a beard. Gave me a nasty turn. He feels my head all over, gentle like, then he taps it round a bit, then he listens in with those tube things. They stood arguing it out after that, and in the end, they sent me for an X-ray photo of my head, but they couldn't see anything there."

* * *

Secure packaging of drugs is desirable, and for drugs for injection essential. But must they be secured even from access by the doctor? The opening of glass ampoules is achieved at peril of lacerated fingers, but pride of place goes to the assortment of opaque media used by radiologists for injection into the various natural—and unnatural—orifices of the body.

When another bottle is needed, the whole procedure, and the attendant team, has to wait while some trembling minion applies in turn Spencer Wells, pointed and blunt scissors, screwdriver, and marlinspike in an attempt to remove the metal ring from around the rubber cap. Many opaque media are now available. Not the least important consideration in making my choice is the ease with which I can get at the contents of the bottles.

* * *

Once a year our local ferryboat has to be overhauled. Fifty weeks of shuttling back and forth across the lake seem to do something to its innards that merits an extensive laparotomy. I think perhaps frustration plays some part in its need for periodical therapy. You see it winds itself backwards and forwards across the lake on two stout cables anchored to either shore. On the east is where it was given birth with the labour pangs of its first shovelful of coal raising the puff of steam to breathe life into a hulk of embryonic steel. On the west is where its predecessor lies broken and rotting—where our own boat will be towed some day. But it is no use brooding on birth and death; life must be lived in between. So our little ferryboat chugs out all its energies on a fixed time-table, on a fixed route, day after day after day, a chain on either side. Can you wonder that it develops behaviour problems?

Anyway, when overhaul time comes round we have to leave the car on the shore and take the little carefree motor launch that the ferry-owners provide instead. Charon still collects an obolus with one hand and steers with the other, but crossing our lake in the dark is worse than any nine rivers in the underworld. It was foggy last Monday night when we set out from the eastern shore for the five-minute passage. After seven and a half minutes we were straining our eyes for the shore, after ten we were getting the wind up. Charon looked distinctly worried himself. He cupped his hands and shouted ahoy there in the best nautical tradition. Echoes from the hillside mingled with a plaintive inquiry as to what in hell Charlie thought he was doing out there, but the earthbound voice could not be further persuaded to define his location beyond the fact that he was *here*, and wherever that may have been was lost again in the swirling fog. At last we ran aground on an island Charlie knew, so we backed off and guessed our way a quarter of a mile south to the ferry's normal route. As we loomed up alongside the regular ferryboat, still in its chains, on the side of the lake where we had embarked, I thought I heard a scornful remark that some people do not know what to do with their freedom when they have got it.

* * *

Having been "kissed better" by Mummy on many occasions, my two-year-old, Elizabeth, assumes that modern medicine as practised by Daddy uses a similar technique. Our friends and neighbours are often reminded that "Daddy kisses his patients better." I hope none complain to the G.M.C.

* * *

The really annoying thing about those flimsy blue airmail letters is that they never can be made to fold properly. When I have carefully filled every square inch of the precious paper, and obediently written my name and address on the back, my troubles are only just beginning.

I flatten it out on the table and read the instructions carefully. "First fold here." I fold, taking care to fit the fold precisely to the line. Then, to my annoyance, the opposite edges do not go exactly into the corners of the gummed bit. I have to admit defeat over this, and proceed to "Second fold here". The same thing happens. When I lick the flaps and fold them, the folds never coincide with the dotted line, and it is always with a feeling of despair that I post the finished article.

The problem doesn't seem to bother my correspondents. They gaily slap their letters together, fail to put their addresses on the back, and even write in pencil; the letters arrive just the same. I sometimes wonder if it's worth it.

* * *

Life's not all jam being an identical twin. When last week my other half had a hæmorrhoidectomy it wasn't only the measles epidemic which kept me on my toes. However, two tags came off last night, and with luck any day now my vicarious suffering will be over, the air-ring discarded, and I'll be able to sit and drive again in comfort.

* * *

How green the field at Richmond on that day
When Thomas's did break The London's heart,
How green that Tommy's misbegotten fan
Who called the brewer's dray a grocer's cart.

Letters to the Editor

FLUORIDATION

SIR,—In the article in your issue of March 12 (p. 590) the difficulty experienced in finding suitable control communities is put forward as one of the reasons why satisfactory statistical experiments have not been carried out. There are, however, in the South Lincolnshire area, which is referred to in the article, communities very close to one another which would be most suitable for control and experimental studies because they receive water with a fluorine concentration varying from 0·5 p.p.m. to 3·5 p.p.m.

This is due to the fact that the bores that supply that area yield water of an increasingly high fluorine content as one passes from Bourne to Spalding. As a result, some towns such as Donnington and Spalding receive water with a fluorine content of about 0·5 p.p.m. whereas Crowland and the Deepings receive water with a fluorine content of 3·5 p.p.m.

While working in this area, the school dental officer and I undertook a few simple comparative studies in Crowland and Donnington, which have populations of about 3000 each and are only 15 miles apart as the crow flies. We found that the incidence of dental caries per child was much higher in Donnington than in Crowland; and that in Crowland mottling was generally mild among children whose main drink was milk, but severe among those whose main drink was tea or "fruit squash". We also found that the number of deaths from carcinoma of the stomach in Crowland over a 10-year period was more than twice as high as in Donnington over the same period. Deaths from all other causes occurred equally in the two towns.

I should like to stress that these are merely the observations of a rural epidemiologist, and would probably be disproved by careful statistical studies. There is undoubtedly a considerable amount of material to be studied in the South Lincolnshire area, and I feel that a long-term investigation of the dental health of the people in that area would provide some useful information on the effects of fluoridation.

Shipley, Yorkshire. H. P. BURROWES.

RAISED INTRACRANIAL PRESSURE ASSOCIATED WITH TRIAMCINOLONE

SIR,—The undoubted value of prolonged steroid therapy must always be weighed against its known hazards, particularly in the growing child. The recognised effects include retardation of bone growth and osteoporosis; the newer compounds may produce quite unexpected complications. Valentine[1] suggested that triamcinolone had produced intracranial hypertension in a child with nephrosis. We believe that we have encountered this effect in two children, and we know that it has been recognised at Dr. Lawson Wilkins' clinic in Baltimore.

CASE 1.—A girl of 7 had been successfully treated elsewhere for severe asthma with continuous steroids for eighteen months before her admission to hospital. For the first three months she had been given prednisolone, 12·5 mg. a day followed by 10 mg. a day for nine months. Because she developed a "moon face" triamcinolone was substituted, at first 4 mg. a day and, after three months, 2 mg. daily.

For two months before admission she had experienced intermittent but increasing headache, vomiting, and diplopia. She had a typical "moon face" but no other features of Cushing's syndrome. The striking feature was severe bilateral papilloedema with a retinal hæmorrhage in the right eye. No ocular palsy could be demonstrated and there were no localising neurological signs.

1. Valentine, G. H. *Lancet*, 1959, i, 892.

X-rays of the skull and chest were normal and bone growth was not retarded. Lumbar puncture revealed normal cerebrospinal fluid under a pressure of over 300 mm. A ventriculogram showed normal cerebral ventricles and, in particular, the lateral ventricles did not have the " pinched " appearance sometimes seen in benign intracranial hypertension; nor did there appear to be any increase in the volume of C.S.F. in the subarachnoid space.

Triamcinolone had been discontinued a week before the ventriculogram, and following this investigation she had no further headache, although it had not been influenced by the preceding lumbar puncture. The papillœdema was less severe five days later, and at this time the C.S.F. pressure at lumbar puncture was 170 mm. Three weeks after stopping the steroid the optic discs were normal and she had no symptoms.

CASE 2.—A boy of $8^1/_2$ had also been successfully treated elsewhere with continuous steroids for severe asthma. For nearly $2^1/_2$ years he had received daily doses of prednisolone varying from 1·25 to 5 mg. Eleven weeks before his admission to hospital this was replaced by triamcinolone 4 mg. a day because he had developed a " moon face ".

He was admitted to hospital with a ten-day history of increasing headache, vomiting, and diplopia, apparently following a blow in the face from a football. He had a pronounced " moon face " but no other features of Cushing's syndrome, the blood-pressure being normal. He had bilateral papillœdema, but no retinal hæmorrhages. Although he habitually closed one eye as if to overcome diplopia, no ocular palsy could be demonstrated and there were no other abnormal signs.

The E.E.G. was normal. A skull X-ray showed slight spreading of the sutures. His height was 48 in. (minus 1 standard deviation from the mean), but his bone age was only 6 to $6^1/_2$ years and there was slight osteoporosis of the lumbar vertebræ (Dr. C. W. P. Bradfield).

Therapy was changed to prednisolone the day after admission, and reduced gradually until stopped 18 days later. Within eight days of stopping the triamcinolone he no longer complained of double vision and the optic fundi had returned to normal. Lumbar puncture was not carried out at the height of his illness, but a week after admission the C.S.F. was normal and was not under increased pressure. He remained free from symptoms, and subsequent skull X-ray showed that the spreading of the sutures had subsided.

It is likely that the prolonged administration of prednisolone to the second child was the cause of the retarded bone growth. The causal connection between treatment with triamcinolone and the development of raised intracranial pressure can only be presumed, but seems highly probable. The symptoms began respectively 4 months and 2 months after starting such treatment and quickly subsided on withdrawing the steroid. No other cause was found and such rapid recovery would not be expected in the usual case of benign intracranial hypertension. It seems, therefore, that a serious rise in intracranial pressure must be added to the list of toxic effects of triamcinolone. We should also like to emphasise that prolonged steroid therapy, however successful, has peculiar dangers for the growing child.

BERNARD M. LAURANCE
W. B. MATTHEWS
R. H. SHEPHARD.

Derbyshire Children's Hospital, Derby.

PRIVATE PATIENTS IN THE NATIONAL SCHEME

SIR,—There are and always will be patients who wish to get the benefits of both " private practice " and National Health Service prescriptions and believe that only a fee will secure their doctor's best attention even when they are registered with him. Such patients regularly offer a cash fee, and as a profession we should face the regrettable fact that there are some doctors who accept such fees. This practice thwarts the efforts of those who carry on their work as faithful servants of their patients fulfilling their Terms of Service. Some N.H.S. practitioners may justifiably not agree with these Terms of Service, but they should not take the law into their own hands.

FORMER LOCUM.

SERUM QUININE OXIDASE

SIR,—We read with interest the comments of Mr. Buys Ballot and Mr. Terlingen (March 12) on the determination of " serum quinine oxidase " by the method discussed by Roman and Dulmanis.[1]

We can confirm their observation that in many cases the addition of serum to buffer alone causes a rise in optical density that would be equivalent to an abnormal level of quinine oxidase.

We agree that the rise in optical density is probably due to precipitation of protein under the conditions of the test.

We were in fact led to try the effect of omitting the substrate after finding a raised " quinine-oxidase " level in a series of patients with Sjögren's syndrome, of which hypergammaglobulinæmia is a common feature.

Courtauld Institute of Biochemistry, The Middlesex Hospital Medical School, London, W.1.

A. L. MILLER
LAURA R. WORSLEY.

MAGNESIUM DEFICIENCY FOLLOWING MASSIVE INTESTINAL RESECTION

SIR,—The problem of whether magnesium deficiency (or a low serum-magnesium) causes specific clinical symptoms, especially those resulting from disordered neuromuscular function, is once again emphasised by the observations of Dr. Fletcher and his colleagues (March 5).

The difficulty in evaluating the significance of low levels of circulating magnesium as a cause of certain clinical symptoms and physiological abnormalities may be due to the multiple deficiencies generally present in such clinical states and in most animals with experimental magnesium deficiency. Probably for these reasons previous attempts to define a clearcut magnesium deficiency syndrome in clinical medicine have largely failed.

At present we are studying a patient with magnesium deficiency after extensive intestinal resection, in many respects similar to the case described by Dr. Fletcher and his colleagues. In our patient serum-magnesium varied between 0·5 and 0·8 mEq. per litre before treatment, and hypocalcæmia and latent tetany were also present. It has been claimed recently [2] that a true magnesium tetany syndrome exists, in which serum-magnesium is low and serum-calcium normal. Administration of 5 g. of calcium gluconate intravenously to our patient, however, resulted in disappearance of the Chvostek and Trousseau signs, associated with an increase in serum-calcium from 6·1 to 8·4 mg. per 100 ml. and a decrease in serum-magnesium from 0·81 to 0·63 mEq. per litre, as determined before and 20 minutes after the injection. Magnesium chloride given by mouth led to an increase in serum-magnesium and serum-calcium, and in renal excretion of both; but this treatment has been too short yet to judge the clinical response.

The changes in calcium metabolism after administration of magnesium can hardly be explained as due to an effect on the renal excretory mechanism. The data we have collected so far rather suggest an increased net movement of calcium from intracellular or bone stores to extracellular space. It may be added that large oral supplements of calcium phosphate, as well as intravenous infusions of calcium gluconate for several days, which in normal subjects causes increased magnesium excretion through the kidney, were without significant effect on calcium and magnesium in serum and urine.

1st Medical University Clinic, Kommunehospitalet, Aarhus, Denmark.

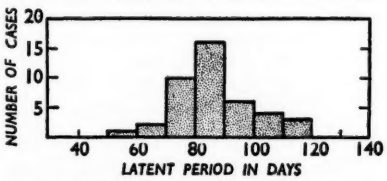
VILLY POSBORG PETERSEN.

1. *Lancet*, 1959, ii, 90.
2. Ulmer, D. D., Wacker, W. E. C., Vallee, B. L. *J. clin. Invest.* 1959, **38**, 1049.

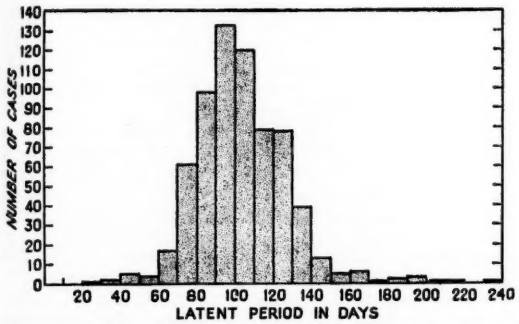
HEPATITIS AFTER INOCULATIONS

SIR,—Your leader of March 5 omits the observations of the late G. M. Findlay on the incidence of hepatitis after a yellow-fever inoculation.

One of the most interesting facets of Findlay's work was that he was able to collect precise information on the



Latent period in a group of 42 cases inoculated at the same time and place.



Latent period from yellow-fever inoculation to first symptoms of hepatitis in 670 cases.

latent period from inoculation of the first symptoms in hepatitis in over five hundred cases. This may well be a unique experience and worthy of record. The accompanying figures are taken from the article by Findlay published in *The Lancet* in 1944.[1]

Chemical Pathology Department,
St. George's Hospital Medical School,
London, S.W.1. N. H. MARTIN.

SIR,—Your leader did not touch on a problem that has vexed me: does the placing of 0·1 ml. of tuberculin intracutaneously from a common syringe through individual needles carry the same risk as other inoculations?

Montclair, New Jersey. N. C. WEBB, Jr.

HYPOGLYCÆMIA ASSOCIATED WITH SARCOMA

SIR,—We were intrigued to read of Dr. Stern's suggestions (March 5) that patients who develop hypoglycæmia in association with certain tumours might be leucine-sensitive individuals in whom the tumour produces enough of this aminoacid to cause hypoglycæmia. We have had the opportunity to make a number of observations on a patient with this syndrome.

In this patient a test-dose of 10 g. of L-leucine given by mouth was followed by a transient small rise in blood-sugar, whereas a similar dose in a leucine-sensitive subject caused the blood-sugar to fall from 59 to 37 mg. per 100 ml. within 50 minutes.[2]

Other observations showed no evidence of an insulin-like effect on the tissue-glucose threshold.[3] Plasma-insulin was within normal limits at a time when the blood-sugar was only 37 mg. per 100 ml. At operation there was virtually no difference in the glucose levels between blood from an artery and from a vein draining the tumour.

The specific activity of plasma-glucose remained unchanged over a period of 60 minutes after the injection of radioactive glucose. This means that there was no entry of unlabelled glucose into the blood, and we infer that the hypoglycæmia in this patient with a leiomyosarcoma was caused by the inhibition of hepatic glucose output.

Since the removal of the tumour the patient has remained free of hypoglycæmic episodes.

A detailed account of this case will be reported elsewhere.

W. J. H. BUTTERFIELD
C. H. KINDER
Guy's Hospital, R. F. MAHLER.
London, S.E.1.

PSYCHIATRIC HALFWAY HOSTEL

SIR,—The excellent and critical account (March 12) by Dr. Clark and Mr. Cooper of the Cambridge experiment with a psychiatric halfway hostel illuminates some of the problems of chronic psychosis.

They observed that the passivity of behaviour, so evident in mental-hospital wards, persisted in the hostel until residents realised that they were free from the hospital organisation. The close connection with Fulbourn Hospital gave an impression that the hostel was an extension of it, and this required special efforts to overcome. Residents did not tend to form social groups or meaningful relationships with one another, yet all were in employment outside. According to our own experience at this hospital, these findings were to be expected.

Although the ability to work in a particular employment may be as high or higher than in normals, social disability tends to be severe in chronic schizophrenia. This is the greatest problem in rehabilitation, yet I believe that it could be prevented to a great extent.

The highly artificial, if comfortable and protective, social life of the mental hospital, in which normal motivation disappears, undoubtedly produces an effect, even in the first few days after admission. While this may not be so important in the affective psychoses in which quick or spontaneous recovery is usual, it may be disastrous in schizophrenia.

Thought disorder, verbal disability, and psychotic isolation hinder communication and promote the lack of interest patients have for one another. For example, two intelligent patients suffering from longstanding schizophrenia shared a room for some years but neither troubled to ascertain the name of the other. In contrast, they were both interested in and well informed about members of the staff in whose departments they worked.

In the life of large groups, without responsibility and deprived of the elemental privacies that are characteristic of a normal environment, with continuous exposure to protective mental-hospital routine and the example of others, social sense is stifled and the patient then accepts as his norm the conditions in which he finds himself. This seems to be more disabling than prolonged immobilisation after a fracture or illness would be in the functional sense. The pattern of the mental hospital, stamped into the patient's mental life during the acute or plastic stages of the illness, plus disuse, may make it impossible for him ever to re-establish himself fully at a normal level. The life of the patient after the acute stage has passed is determined mainly by domestic conditions, hospital design, and administrative custom. If these could be altered realistically early enough, social disorientation might be prevented.

An experimental day centre (distinct from the Bristol Day Hospital) for the rehabilitation of chronic psychotics is being developed at Barrow Hospital. With the object of breaking the hospital habit, patients initially live, eat, work, and receive psychotherapy during the day at the centre as "internal day patients". They only sleep at the hospital, and are taught to regard it as temporary accommodation necessary for their work and a certain phase of emergence from illness. As soon as possible they live at home, to attend as "external day patients"

1. *Lancet*, 1944, ii, 302.
2. Butterfield, W. J. H., Whichelow, M. J., Wright, P. H., Woolf, L. I. *Nature, Lond.* (in the press).
3. Butterfield, W. J. H., Holling, H. E. *Clin. Sci.* 1959, **18**, 147.

by ordinary public transport or picking up the hospital coach. Some travel more than 12 miles and are rarely late.

It is hoped to find places for these patients in industry, and the recently formed company—I.T.O.—in Bristol will be invaluable.

The possibility of treating acute cases of schizophrenia, even during the first week in hospital, at the centre is being explored.

It appears that:

(1) Schizophrenic patients learn from normals by contact and example but not from one another. Living amongst normals promotes normal values.

(2) Occupation must be gainful, with remuneration according to effort.

(3) The integration of patients in small numbers with normals, at work and outside, is to be aimed at. Even travelling by public transport to work is appreciated as being a procedure involving normal people and normal habits.

(4) The response of any patient to rehabilitative measures cannot be predicted, for even longstanding cases may suddenly show a remarkable social recovery. Much research remains to be done in motivation and allied problems.

(5) The application of the day system early may prevent chronic social disability.

(6) Boarding-out or lodging homeless single patients with interested families is the ideal.

(7) A halfway house or hostel should be situated well away from the hospital and organised on non-hospital lines.

Although the importance of social rehabilitation of psychotics is widely recognised, the fringe of the problem has hardly been touched. Adequate funds to provide something like conditions of a normal social life, with sufficient staff to treat patients in small groups and revision of old-fashioned concepts of the needs of the psychiatric hospital, are a prime necessity. For, in spite of all our efforts, only a small proportion of young and recent patients with schizophrenia are discharged from treatment without some semipermanent social disability.

Barrow Hospital, Bristol. R. E. HEMPHILL.

DISORDERS OF "PERSONAL TIME" SENSE

SIR,—Dr. Gooddy [1] drew attention to the ways in which disorders of " personal time " sense may be provoked. We can confirm that even normal persons may under stress exhibit gross disorders of this nature with possible far-reaching practical implications.

Towards the end of a series of experiments designed to study the effects of high temperatures on Service personnel in Singapore a number of volunteers were exposed at rest to a very warm and humid atmosphere until they either collapsed or were on the verge of collapse. The following abstract from an unpublished report [2] gives some indication of the type of disorder in " personal time " which was observed :

" As time went on the subjects, and at times the observers, became poorly orientated in time and accused the technicians in the air-conditioned observation chamber incorrectly of not making measurements at the correct time and of not bringing drinking water as quickly as they might. Time passed very slowly and the measurement of skin temperatures seemed to be a never-ending procedure. The subjects mistook the observers' names, used the wrong words when they spoke and slurred their words, they became either euphoric and talkative or morose, irritable, and suspicious, and these attitudes sometimes alternated during the same experiment. The writing on their note pads became larger, less distinct, and less intelligible until this duty had to be turned over to a technician. One of them repeatedly insisted that he was clear-headed and quite fit whilst he was mistaking the names of the observers whom he knew well and thought the time was an hour later than it was although he was looking straight at a clock only a few feet away. These mental aberrations, associated with some cyanosis and temporal and circumoral pallor on using the facial muscles, were very suggestive of cerebral anoxia."

1. Gooddy, W. *Lancet*, 1959, ii, 1155.
2. Ellis, F. P., Lind, A. R., Newling, P. S. B. Report R.N.P. 53/760 to the Medical Research Council's Royal Naval Personnel Research Committee; incorporated in Physiological Responses to Hot Environments, a compilation by R. K. Macpherson in the Medical Research Council's Special Report Series (in the press).

Thus, not only may " personal time " sense be impaired, but the person affected may be euphoric and overconfident or, alternatively, morose and irritable, and this combination of symptoms may occur some time before he succumbs to heat stress. This underlines the importance of keeping those who have the work at very high temperatures under strict observation by an observer who is not himself in a position to be equally affected by heat stress, and ensuring wherever possible that men with significant responsibilities are not exposed to conditions which may render them grossly incompetent.

Medical Department of the Navy, Admiralty, London, S.W.1. F. P. ELLIS.

THE CARPAL-TUNNEL SYNDROME

SIR,—I was most interested in the papers by Dr. Wilkinson and Dr. Foster on the carpal-tunnel syndrome (Feb. 27) and the methods of treatment recommended. I should like, however, to make some observations before this condition is accepted as a clinical entity.

The proportion of patients attending clinics and complaining of these symptoms appears to be increasing and they are often associated with rheumatic manifestations in other parts of the body. In my experience, in the great majority of cases, these symptoms are caused by " myalgic areas or spots " in the muscles of the shoulder girdle referring pain, spasm, and other signs of acroparæsthesia to the wrist, hand, and fingers.[1]

Deep pressure over these spots will accentuate the symptoms, and injection of 2% procaine into them will often relieve the pain almost at once. Symptoms are worse at night in bed because of the continuous body pressure on the spots.

These spots may originally have been due to repeated trauma and may have remained quiescent for long periods until they were triggered off by some exciting factor, such as strap-hanging in tubes and buses, carrying heavy packages, or a strain or a fall. Having treated very many patients on these lines I find it is usual to discharge them symptom-free within three weeks, and there are very few recurrences.

In my view, therefore, surgical interference or other local treatment is not essential and should only be used in the absence of myalgic spots in the shoulder girdle.

London, W.1. LOUIS MOSS.

LEAF PROTEIN AS HUMAN FOOD

SIR,—Mr. Pirie's article [2] refers to the possibility of the production of leaf protein for human consumption, particularly in areas " where the need is most acute ". As a matter of fact, during the famine in Bengal in 1943, protein material was extracted in this laboratory from grass, water hyacinth, and certain other waste leaves and fed to people in the form of some familiar Indian preparations. It was well received. Since then leaves of a number of other species of plants including those of jute, sugar-cane, maize, cassava, and banana, which might be obtained as rejection from plantations, were examined. More recently leaves of leguminous plants, which contain 27–35% protein on the dry basis have been investigated.[3] Some of the results obtained will be published elsewhere in detail.

The industrial production of leaf protein is desirable. In undernourished countries of the world, however, the larger body of the population lives in villages. A domestic method which has been developed is that of macerating crushed green leaves with 2% sodium carbonate solution, straining the extract through cloth, slightly acidifying it with lemon juice or tamarind juice, and warming, when the protein material is precipitated. This is filtered through cloth giving a green protein material with a leafy flavour. The colour and flavour,

1. Moss, L. *Lancet*, 1957, i, 1090.
2. Pirie, N. W. *ibid*, 1959, ii, 961.
3. Pal, P. R., Guha, B. C. *Sci. & Cult.* 1953, **18**, 597.

however, do not matter if the fresh protein material is incorporated in common Indian dishes like curries, "pakora" (a fried "snack" with vegetables), and "puries" (fried thin slabs of wheat flour dough). By the above method of extraction about 60% of the leaf protein is obtained, the rest remaining in the residue, which can be fed to cattle, as they need protein also. This method has been actually practised in the home and found satisfactory.

This method has also been used on a fairly large scale for the extraction of protein from leaves of grass, water hyacinth, glyricidia, ramie, and drumstick, by using conventional equipments. The protein materials so obtained have been exhibited in the pavilion of the Ministry of Food and Agriculture of the Government of India in the World Agricultural Fair which opened in New Delhi in December, 1959. Indian food preparations incorporating these protein materials were made and were well received by visitors. It would appear therefore that there is considerable possibility of the development of leaf-protein food on both domestic and industrial scales.

Department of Applied Chemistry,
Calcutta University, India. B. C. GUHA.

TREATMENT OF HÆMANGIOMATA AND INFANTILE SCOLIOSIS

SIR,—There is a curious likeness between the two controversies, on hæmangiomata and infantile scoliosis, which I have deliberately stirred up in your journal recently, with the object of questioning the present teaching that both conditions should be studied but not treated.

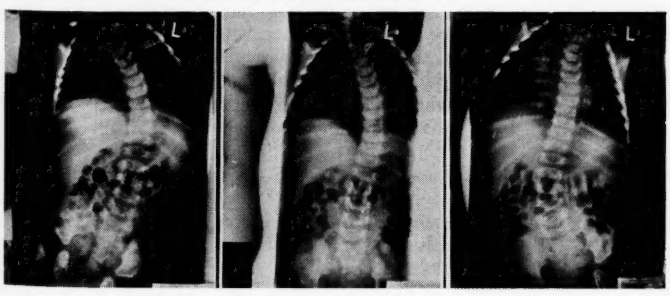
I cannot say that I am impressed by this "study" and it embarrasses me to think what a trained biologist would think of it. Consider:

(1) Both conditions are progressive, yet in neither is there an attempt to identify the earliest stage of this progress; while regarding angiomata there is considerable disingenuousness about the disfigurements left by the final stage. The series of photographs shown by Dr. Russell (Jan. 30) illustrates this; the angioma is first shown growing rapidly at the age of two months; what was it like two months earlier?

(2) Mr. Scott (Feb. 27) states that 80% of babies have scoliosis at six months, the condition gradually becoming less common till none are affected at two years. As this opinion is based on the X-rays of 75 children who were not themselves examined, it seems to me that all he has discovered is that 80% of young babies squirm when held down on a hard X-ray table, and that as they grow older they squirm less. James [1] quotes this curious result of "study" as showing that scoliosis is very common in infants, though in my experience it is very rare, occurring as far as I can make out once in many thousand births.

As to X-ray evidence, I think far the best and the only reliable one is what I call a "triptych". In the accompanying example the centre picture shows the relaxed position, flanked by records of the full lateral range of movement to either side. This is a typical example, from a baby with a typical history. His mother noticed a crooked back at five weeks: she was given the usual advice by her general practitioner. After another five months had been wasted the deformity was so obviously worsening that it was sent to me. The radiologist reported that the triptych showed no fixed scoliosis, whereas I consider it a classical example of this; the curve increasing on bending in one direction, and not entirely disappearing when bent in the other. After splinting and physiotherapy the child is now, at three years, clinically normal.

1. James, J. I. P. Modern Trends in Diseases of the Vertebral Column. Edited by R. Nassim and Jackson Burrows. London, 1959.



(3) Surely an important part of the study of surgical conditions is that of the effect of treatment on them. I cannot see the sense of deferring treatment till we understand the ætiology: supposing we never agree on this, do we never try treatment?

(4) As to the ætiology I have a simple explanation of this, at present barred by the orthodox orthopædic ban on discussing intrauterine conditions. James [1] argues that I cannot be right in considering it due to malposition in utero, since in only two of his cases was it present at birth. The neglect to distinguish between being present and being noticed deprives this of all meaning.

(5) In both instances I am challenged to provide evidence that is obviously impossible to obtain, since it involves knowing what would have happened had nothing been done. Any good results obtained by treatment will meet the criticism that the condition would have cured itself anyway.

(6) Finally I submit to my colleagues the opinion that in the sight of Heaven one is not justified in withholding treatment from a group of ill-understood cases on the grounds that some, nobody knows which, will get better spontaneously.

London, W.1. DENIS BROWNE.

"CRISIS IN NURSING"

SIR,—The suggestion by Mr. Atkins (March 12) that the training of theatre nurses be divorced from that of ward nurses did not appeal at all to the nurses to whom I showed his letter. "The cool hand on the fevered brow" concept of nursing has long since passed, and nowadays girls enter the profession because it is an eminently worthwhile career offering reasonable prospects, a measure of responsibility, and variety of experience; it is this variety which is particularly attractive in view of the tedium of so many careers open to girls of this age.

If the profession can only offer potential recruits either pure ward nursing or pure theatre nursing, it will be in danger of losing the valuable type of girl who has both character and resource and who, by her very nature, could not give of her best in a monotonous job.

While the theatre nurse would not suffer from lack of experience in the wards, the ward nurse would surely feel the lack of theatre experience very keenly, particularly when working on surgical wards. Her effectiveness in reassuring the patient about to go for operation would be seriously impaired if it was as much a mystery to her as to her patient, and can she really be so concerned about postoperative progress if the surgical proceedings are, at best, learnt second-hand from a textbook?

Specialisation has surely gone far enough in the nursing profession. Let us continue to give a varied basic training to produce nurses, and not merely theatre technicians, or ward orderlies.

Bristol. GEOFFREY H. ROBB.

SIR,—Does Mr. Atkins realise that throughout their training nurses are repeatedly "drafted from the wards", to casualty, outpatients, diet kitchens, and from medical to surgical wards, as well as to theatres.

Remembering the apprehension with which I viewed my first visit to the theatre, accompanying a patient from the

surgical ward, I cannot imagine many young people wishing to do theatre work, and theatre work only, without some initial introduction.

Now that there is so much mechanisation in theatres I can see the need for a theatre technician. Does Mr. Atkins suggest that an apprenticeship as an electrician, or a fitter, might be a better preparation than the drudgery of sluices and bedpans. Would the technicians assist at operations too?

How will nurses in training ever discover whether they have the temperament peculiarly fitted to theatre work? Many find out only after practical experience on both wards and theatres.

York. F. E. R. JEWITT.

CEREBRAL ANGIOGRAPHY IN THE DIAGNOSIS OF THE ACUTE STROKE

SIR,—The article by Dr. Bull and his colleagues in your issue of March 12 is a most useful contribution to the knowledge of this interesting and topical subject. In the South-Western region we have recently surveyed 100 consecutive cases of "stroke syndrome", this term being used to describe cases with a presenting symptom of unilateral weakness or paralysis of sudden or recent onset, and cases were not excluded because subsequent finding showed a lesion other than a vascular one. Apart from the difference in the rapidity of onset, there was a close similarity in the clinical histories of these patients, and cerebral angiography had been requested as an aid to diagnosis. One of the main objects of the survey was to attempt to assess the frequency of carotid-artery disease, for it is well recognised that diagnosis in the pre-hemiplegic phase is most important if there is to be a chance of successful treatment. We found complete occlusion in 13 cases and partial occlusion in a further 4. This is in general agreement with Dr. Bull's findings and also with those of Tatelman [1] in Detroit, who analysed 200 consecutive cases of "strokes" referred to a cerebrovascular unit.

It is most important to assess this frequency in the light of the present accepted knowledge that half to two-thirds of cases of complete occlusion have a premonitory history, often long drawn-out, of unilateral symptoms before the onset of the final episode. Thus Luessenhop,[2] in a survey of the world's literature, covering 486 cases, found that only 108 cases had an acute onset of less than forty-eight hours; the majority extended over weeks or even months. 1 of our patients with carotid stenosis had in fact a history of six months' weakness and stiffness of the joints of the hand, for which he had been originally referred to the orthopædic department. Carotid angiography revealed the stricture and thrombo-endarterectomy resulted in complete relief of symptoms.

In those cases with a subacute onset there were a number of tumours both of glial and meningeal origin, subdural hæmatomata, and also unsuspected intracerebral abscesses. Amongst those with an acute onset were cases of arteriovenous malformation, 2 of which had bled for the first time in subjects over the age of 55 years, and a remarkable case of a meningioma in a man who had been confined to bed hemiplegic for four years following an acute "stroke". Removal of the tumour resulted in his being able to walk again.

One of the main conclusions of our survey was that 10–15% of cases presenting in this category of "stroke syndrome" were likely to have underlying operable conditions. It would therefore seem rewarding to investigate more frequently those cases with a progressive or recurrent unilateral history, in the hope of discovering those conditions which are amenable to treatment, and particularly of forestalling those which at the moment proceed to complete occlusion of the carotid artery.

Frenchay Hospital, Bristol. J. L. G. THOMSON.

1. Tatelman, M. *Radiology*, 1958, **70**, 801.
2. Luessenhop, A. J. *J. Neurosurg.* 1959, **16**, 705.

SIR,—In their informative paper, Dr. Bull and his colleagues point out that cerebral vessels may be displaced by the œdema of infarction as well as by intracerebral hæmorrhage. Great difficulty may arise in this differential diagnosis even where a subarachnoid hæmorrhage has clearly taken place as shown by the presence of blood in the cerebrospinal fluid. The occurrence of quite large cerebral infarcts is now a well-recognised complication of subarachnoid hæmorrhage; and, although displacement of cerebral vessels in the presence of subarachnoid hæmorrhage usually denotes an intracerebral hæmatoma, it may be the result of infarction.

I recently saw a young man who had undergone clipping of the right anterior cerebral artery for aneurysm eighteen months previously. He was admitted with subarachnoid hæmorrhage, and angiography showed that the wire clip had come off the artery (which was patent). Displacement of the anterior cerebral arteries to the left was wrongly assumed to be due to a hæmatoma, and craniotomy revealed only infarction of the frontal lobe. Aspiration by means of a burr-hole and cannula would probably have saved a needless major operation, and I would suggest that this simple procedure should be an invariable preliminary to craniotomy in these cases (unless, of course, an open operation is to be performed anyway for a direct attack on an aneurysm or angioma).

Middlesbrough General Hospital, Middlesbrough, Yorks. P. R. R. CLARKE.

THE ROYAL COMMISSION AND TIME-EXPIRED SENIOR REGISTRARS

SIR,—On p. 91 of the report of the Royal Commission on doctors' and dentists' remuneration we read that "In mid-1959 there were at least 141 senior registrars who had completed training and were awaiting higher posts".

One of the reasons most frequently given by regional hospital boards for not increasing the number of new consultants in their areas is lack of money. Thus the recommendation of the Royal Commission that there should be a new category of 100 A-plus distinction awards of £4000 each for consultants, in addition to existing awards, must come as a bitter blow to those of us who are in our sixth (and even later) year of training and waiting. Indeed several of us have attained additional qualifications such as the CH.M. or M.D. by thesis, and even Hunterian professorships—achievements which are no doubt often noted by Lord Moran and his colleagues when granting distinction awards at present.

I should like to suggest that no A-plus distinction award should be offered by the Government or accepted by members of our profession until *all* the time-expired senior registrars have been granted consultant status. Such a gesture on the part of the Government and our seniors would do much to reduce the bitterness and frustration in the hospital service.

TIME-EXPIRED SENIOR REGISTRAR.

*** The A-plus awards cannot fairly be dissociated from the other recommendations of the Royal Commission. As a whole, these recommendations would raise the remuneration of all consultants, and increase its range, while reducing the proportion who get more than basic rates. Our correspondent is presumably objecting to the increase of *range*. Though, like him, we deplore the failure of the N.H.S. to provide, in some places, enough consultants for the work in hand, and its failure to give suitable posts to some of those it has trained, we do not think that in their present form his proposals would do much to help. The cost of improving the service by creating new consultant appointments can be

quite substantial when they involve giving the new consultant new staff. With surtax as it stands, the amount the Treasury would save by paying a hundred consultants £3000 rather than £4000 would not suffice to influence the Government's policy towards new posts.—ED. L.

LUNG CANCER AND TOBACCO MOSAIC VIRUS

SIR,—There is no need to discuss again the improbability of the suggestion [1] that tobacco mosaic virus may be a cause of lung cancer, because it has already been commented on.[2] But one point in the revival of the idea by Dr. Bothwell (March 19) should be quickly contradicted. There is nothing peculiar in the smokers' relationship to the swallowed decomposition products of R.N.A. from the T.M.V. in a cigarette. There are many other sources of heated R.N.A. Steak cooked in the English style—i.e., singed on the outside and raw in the middle—contains the whole gamut of products of pyrolysis of R.N.A.

Two assumptions would have to be made to give the suggestion any a-priori probability: that the effective agent is volatile, and that some special component is present in T.M.V. but absent from other forms of R.N.A.—e.g., that from healthy tobacco leaves and edible parts of animals and other plants besides tobacco. There is no evidence for either assumption. Obviously the absence of evidence does not constitute disproof, and it may be worth comparing the effects of tobacco from infected and uninfected plants. Anyone doing this should however remember that virus infection leads to many chemical changes in the host besides the multiplication of the virus. Any one of these changes could explain a correlation—if one should be found.

Rothamsted Experimental Station,
Harpenden, Herts. N. W. PIRIE.

SOME UNCRITICISED ASSUMPTIONS IN PSYCHIATRIC THOUGHT

SIR,—Psychiatric treatment will remain largely a matter of conflicting opinions, at least until more is known. When psychiatrists set up their opinions against each other, judgment is more a matter of legal logic than reliance upon the treasured "scientific verifiability".

A psychiatrist should first reveal his bias (system of opinions) whenever he ventures to speak. Mine coincide with those of Dr. McConaghy (March 19) in critical unrest about Freudian psychotherapy; deviate sharply away as regards the use of the organic analogy.

Should we be unduly sensitive or irritable if query is turned on the reasons for all our divergences, or if somebody wants to query staff mentality as well as patient mentality? Or is "mentality" likely to become a bad psychiatric word, bearing as it does metaphysical and unphysiological odours?

Meanwhile, some psychiatric patients continue to get well and others do not—all subjected to a variety of processes physical, chemical, and, for the present at least, psychological. Perhaps it is fortunate that our patients are independent of our conflicts; perhaps our patients are under the patronage of some dialectical deity. And perhaps we must look for more knowledge about psychiatry in a dimension which is not confined to our favoured categories—what has been called the hoped-for Einsteinian revolution in psychiatry. Einstein included observer-bias and subjectivity in his theories.

And why do critics of psychology and psychotherapy in psychiatry always treat the subject superficially? Perhaps this is the cause of the criticism and the rejection—namely, the failure to understand, which underlies all human problematics, including our psychiatric patients. And I fail to understand Dr. McConaghy's distinction between the psychiatrically ill and the neurotic.

1. *Lancet*, 1955, ii, 144.
2. *ibid.* p. 199.

The tendency to regard psychiatry as primarily a physical matter on a par with general medicine and to minimise psychodynamics may arise out of the inability to provide psychotherapy, owing to lack of time or disinclination or overcrowded psychiatric practice, or other similar reasons. The temptation to make a virtue out of such necessity should be resisted. If we have not the time for psychotherapy and psychodynamics let us say so, instead of suggesting that it is because psychiatric patients are fundamentally or predominantly organic problems.

St. George's Hospital,
Stafford. H. M. FLANAGAN.

HISTORY AND THE PARASTERNAL LYMPH-GLANDS

SIR,—Your annotation of March 19 has made charming reference to the work of my father and me. At the risk of seeming churlish and pedantic, I must nevertheless point out that Dr. W. S. Halsted's remarks in 1898 [1] were not "the first known record of interest in the spread to the internal mammary lymph-glands of cancer from the breast." What is probably the first reference to this matter reads as follows: "The case is equally or perhaps more hopeless, if the mammary absorbents have carried the poison to glands within the chest, out of the reach of surgery, the patient then must die."

To continue the mode of your annotation, it seems likely that even the question-master would not have placed this quotation. It was written by W. C. Cruikshank in 1790 in the second edition of his book *The Anatomy of the Absorbing Vessels of the Human Body*.[2] Cruikshank was the probable discoverer of the internal mammary lymph-nodes (the Italians favouring Mascagni) and the context of the passage quoted leaves no doubt that he was referring to these nodes and the spread of cancerous "poison" to them. In 1805 Sir Everard Home, in his *Observations on Cancer connected with Histories of the Disease*,[3] described a case in which breast cancer had metastasised solely to the internal mammary chain, and expressed his belief that "when it takes such a course the lungs are liable to be affected by it." I know of two other plain references to invasion of the parasternal lymphatics before Halsted's paper was published.

You have commented on the therapeutic problem posed by invasion of the parasternal lymph-nodes in breast cancer. May I concur with your remarks and add some personal comments? Neither the surgical excision nor the radiotherapy of these nodes has yet had time to prove its usefulness. In some quarters there has been loud condemnation of extended radical mastectomy because of the added mutilation it involves. This is the wrong reason for condemnation, because extended radical mastectomy adds little to the hateful deformity produced by even a simple mastectomy. It is on results that judgment must be based, and it must be admitted that so far only the technique described by Urban [4] seems to offer promise. I have abandoned the extended mastectomy technique which Patey, Hand, and I described in your columns,[5] because its early results do not show any improvement over less drastic operations. It is my personal view that irradiation will displace surgery for treating the internal mammary chain; and it is encouraging to know of Smithers and Rigby-Jones' new technique because hitherto irradiation has shown no more notable achievement than surgery in coping with internal mammary deposits. In the first serious and sustained attempt ever made to deal with parasternal deposits, my father used irradiation by implanting radium tubes in the intercostal spaces after he had completed a radical mastectomy. His brilliant conception did not yield the results which it deserved to show. Nor has conventional

1. Halsted, W. S. *Ann. Surg.* 1898, **28**, 557.
2. Cruikshank, W. C. The Anatomy of the Absorbing Vessels of the Human Body. London, 1790.
3. Home, E. Quoted in *Cancer*, 1953, **6**.
4. Urban, J. *Cancer*, 1952, **5**, 992.
5. Handley, R. S., Patey, D. H., Hand, B. *Lancet*, 1956, i, 457.

radiotherapy with the 200-kilovolt machine been any more successful in producing histological "sterilisation" of parasternal lymph-nodes than it is with axillary lymph-nodes; as I have seen by doing biopsies of the parasternal nodes after completion of a course of radiotherapy.

John Hunter said "Don't think—try the experiment". The experiment of treating deposits of breast cancer in the parasternal nodes needs time and detached observation, not hasty judgments.

The Middlesex Hospital, London, W.1. RICHARD HANDLEY.

BRETYLIUM TOSYLATE IN THE TREATMENT OF HYPERTENSION

SIR,—Dr. Lowe and Professor Rosenheim (March 19) report exertional hypotension in patients receiving bretylium.

In the 13 patients whose blood-pressure was recorded before and after exertion, readings taken during exertion would have been of great interest. This can be done with the patient exercising on an ergometer.

We have shown [1] that in mild hypertension a rise of blood-pressure occurred during exertion which was more pronounced than in normal persons. Hexamethonium depressed not only the resting blood-pressure but the peak blood-pressure during exercise. In severe hypertension, a fall in blood-pressure may occur during exertion with a post-exertional rise. Hexamethonium did not cause an alteration in the pattern of blood-pressure changes during exercise. However, after exertion a marked fall of blood-pressure sometimes occurred. This post-exertional fall in blood-pressure was not related to treatment.

In the group of patients receiving bretylium with symptoms on exertion described by Dr. Lowe and Professor Rosenheim, one would like to know not only the blood-pressure changes during exercise while under the influence of bretylium but also the changes during exercise when untreated.

London, W.1. P. B. S. FOWLER.

CATHETER DRAINAGE AND INFECTION IN ACUTE RETENTION OF URINE

SIR,—Dr. Steele (March 5) has already referred to the catheters which I have devised for use after prostatectomy and bladder operations in general. These catheters will be described in more detail elsewhere, but in view of the recent correspondence, it is worth noting that they have been in use in the department of urology at Jervis Street Hospital, Dublin, for almost two years and have proved very satisfactory.

The catheters are made on the Gibbon pattern, and of the same material (P.C.V.) but they are whistle-tipped and size 18F. Because of their thin but adequately rigid wall and the consequent high ratio of bore to external diameter, larger sizes have not been found necessary. Two different modifications are available: (*a*) a sliding flange catheter which allows the length of catheter in the urethra and bladder to be adjusted to the patient's requirements; and (*b*) an irrigating pattern with a small external side tube for continuous irrigation: in this second variety the flange is fixed as in the original Gibbon catheter. The distal end of the catheter is adapted to fit a standard Lane bottle to provide closed drainage.

We have found postoperative blockage much less frequent with these catheters than with other varieties. Because of the length of the catheter, when washouts are necessary they can be performed with much less mess and with far greater attention to asepsis than in the case of catheters of standard length. The catheters are sterilised by autoclaving and can be used repeatedly. They are readily available from Messrs. Portland Plastics.

Jervis St. Hospital, Dublin. ANTHONY WALSH.

1. Fowler, P. B. S., Guz, A. *Brit. Heart J.* 1954, **16**, 1.

Parliament

Filling a Practice Vacancy

IN a debate on the adjournment on March 14 Mr. HORACE KING, PH.D., suggested that there was often unnecessary delay in filling a practice vacancy because the executive council's selection had to be confirmed by the Medical Practices Committee and because candidates then had the right of appeal to the Minister. This procedure could cause a delay of six months during which it was difficult to hold the practice together. Local executive councils resented suggestions that they might be susceptible to improper influences. They suggested that they should be allowed to make these appointments subject only to the check of an appeal to the Medical Practices Committee. Appeals, they proposed, should be restricted to candidates on the short list.

Miss EDITH PITT, parliamentary secretary to the Ministry of Health, pointed out that only a few vacancies were filled by this procedure, which was not used for partners or assistants. Last year, for instance, only 168 doctors were appointed to advertised single-handed vacancies, whereas 900 were admitted to the medical list in other ways. In 1959 the average number of applications for these vacancies was 24, but for vacancies with substantial lists in the South of England competition was keen and 99 doctors had applied for a vacancy in Hove. Where there were so many applications, many well-qualified applicants were inevitably excluded from the short list. But for the knowledge that their claims were reviewed by an impartial body such as the Medical Practices Committee, there might well be more time-consuming appeals. As it was, the average time taken to fill a vacancy—57 days in England and Wales and 60 days in Scotland—was well within the three months' notice required of a doctor retiring from the National Health Service.

QUESTION TIME

Control of Drugs

Mr. SYDNEY IRVING asked the Home Secretary if he would state the date from which the ban on the sale of 'Preludin' and the twenty other substances listed by the Poisons Board except by medical prescriptions would become effective. —Mr. R. A. BUTLER replied: After considering representations I have decided to ask the Poisons Board to reconsider the scope of its recommendation with respect to guaiphenesin. My information is that this substance is not at present available in this country in any preparation that is liable to abuse. I have also decided that no further control is necessary in respect of nialamide, which is already subject, under the Therapeutic Substances Act, 1956, to substantially the same degree of control as that recommended by the Poisons Board. With these exceptions, I hope to put into effect, from the beginning of next month, the recommendation of the Poisons Board relating to the substances mentioned in my answer on Feb. 11.[1]

'Imferon'

Lord BALNIEL asked the Minister of Health, in view of the doubts which have arisen regarding the safety of this drug, whether he would ensure that it is not included in *Prescribers' Notes* until further tests have been undertaken.—Mr. DEREK WALKER-SMITH replied: The manufacturers have now informed me that they have decided to suspend the sale of this drug for general use pending an independent re-examination of all the available evidence.

Juvenile Courts in Hospitals

Dr. DONALD JOHNSON asked the Minister under what authority the Sheffield Regional Hospital Board was approaching magistrates with a view to establishing special juvenile courts in hospitals to intervene if parents refuse permission for an operation on a child; and what plans he had for establishing similar courts in hospitals in other regions.—Mr. DEREK WALKER-SMITH replied: The Sheffield Regional Hospital Board is seeking to ensure only that the existing

1. See *Lancet*, Feb. 20, 1960, p. 446.

provisions of the Children and Young Persons Act, 1933, should, if invoked in an emergency, operate speedily. The board does not need any specific authority for this, and any similar action elsewhere would be a matter for the hospital authorities concerned.

Home Nursing Service in London

Mr. ROBERT JENKINS asked the Minister whether he had now reached a decision on the London County Council's proposal to take over the home nursing service.—Mr. WALKER-SMITH replied: I have informed the Council that I consider that the right course is to defer any decision until the report of the Royal Commission on Local Government in Greater London has been received and considered.

Brain-washing

Mrs. BARBARA CASTLE asked the Minister of Health to what extent National Health Service psychiatrists were made available to the Services, the police, or the security authorities, for interrogation or brain-washing.—Mr. WALKER-SMITH replied: No such arrangements have ever been made. Mrs. CASTLE: Is the Minister aware that Dr. Kennedy, who does National Health Service work, has declared that he has no complaint against the content of the report of his speech in the *Observer*, in which he stated that a technique of brain-washing was developed in Britain during the war and was used to extract confessions?—Mr. WALKER-SMITH: It is quite clear what Professor Kennedy did not say. He did not say that these techniques had ever been used in this country. In fact, the material contained in Professor Kennedy's discourse had been previously published in journals available in this country, and perhaps, if the hon. Lady has not already done so, she could study the article in the *Archives of Neurology and Psychiatry* for August, 1956.

National Health Service Expenditure

Lord BALNIEL asked the Minister the gross cost of the whole of the National Health Service for Great Britain as a percentage of the gross national product in 1949, 1951, and in each subsequent year.—Mr. WALKER-SMITH replied: The figures [1] are as follows:

	%		%		%
1949 ..	3·7	1953 ..	3·4	1956 ..	3·3
1951 ..	3·5	1954 ..	3·3	1957 ..	3·3
1952 ..	3·6	1955 ..	3·3	1958 ..	3·4

A firm figure for 1959 is not yet available, but such estimates as can at present be made indicate that it may be about 3·6%.

Manslaughter Sentences

Dr. DONALD JOHNSON asked the Home Secretary whether he was aware that Michael Dowdall, who was recently tried on a charge of murder at the Old Bailey and found not guilty on a successful defence of diminished responsibility,[2] was sentenced to life imprisonment for manslaughter, and that there was consequent anxiety that, by virtue of the usual remissions to such a sentence, this man would be freed after a term of years; and whether he would make a statement of policy in regard to remission of sentences of imprisonment imposed under the provisions of section 2 of the Homicide Act.—Mr. R. A. BUTLER replied: Persons sentenced to imprisonment for manslaughter under section 2 of the Homicide Act are in the same position as those sentenced for any other form of manslaughter. If the sentence is a determinate one the prisoner may earn remission; but if it is a sentence of life imprisonment there is no remission and it rests with the Secretary of State to decide when to discharge the prisoner on licence. In considering when any prisoner sentenced to life imprisonment can be discharged the Secretary of State takes into account, among other factors, the question whether the prisoner is likely to be a danger to the public, and particular attention will be paid to this point in dealing with prisoners whose responsibility for their offence has been found to be diminished.

1. The gross national product has been taken at market prices. The cost of the N.H.S. has been taken as total expenditure met from all sources of revenue. The figures have been interpolated from those for financial years.
2. See *Lancet*, Feb. 6, 1960, p. 331.

Children on Remand

Mr. A. G. BROWN asked the Home Secretary how many children under 16 years of age were remanded to Holloway Prison, instead of being sent to remand homes, during January, 1960.—Mr. DENNIS VOSPER replied: Two. Mr. BROWN: Is the Minister aware that the measure of public concern over such imprisonment of children is reflected in the widespread publicity the national Press has afforded the alarming disclosure, by a recently discharged prisoner, that a little girl of 14, guilty of a breach of probation in that she played truant from school, is incarcerated in a ward of Holloway Prison hospital and is in the company of adult prisoners awaiting trial on such grave charges as murder and attempted murder? Mr. VOSPER: I share the concern about this particular case, which is additional to the two to which I referred in my answer. The juvenile court concerned acted quite properly under section 27 of the Criminal Justice Act, 1948, and this child was committed to Holloway as there was no place available at a classifying school. I have investigated the matter and a place has been found for this girl in an approved school to which she is being sent.

88-hour Fortnight for Nurses

By Oct. 31, 1959, the 88-hour fortnight had been introduced in full or substantially by 87%, partially by 11%, and not at all or negligibly by 2% of the general hospital groups. Corresponding percentages for mental and mental-deficiency hospital groups are 91%, 5%, and 4% respectively, and for teaching hospitals 66%, 17%, and 17%. The Minister of Health has told hospital authorities that he expects them to complete the introduction of the 88-hour fortnight in the next financial year.

Public Health

Mental Health Statistics

THE Supplement on Mental Health to the Registrar General's Statistical Review of England and Wales for the three years 1954–56 [3] contains detailed statistical tables with a brief commentary on the more important items.

Populations of mental hospitals.—Although the numbers of admissions to and discharges from mental hospitals continued to increase year by year, the numbers of patients resident at the end of each year decreased from 148,080 in 1954 to 145,593 in 1956.

Admissions to mental hospitals.—There were 83,994 admissions in 1956, of which first admissions numbered 47,413 (56%). First admissions in 1956 exceeded those for 1951 by 23% for males and 22% for females, and admissions for a second or subsequent visit were 75% higher for males and 79% higher for females. By 1956 the proportion of voluntary patients among first admissions had reached 78%.

Admissions to mental hospitals according to area of residence.—An analysis of first admissions by type of area of residence of patients shows that, for psychoses of all forms together, people living in rural areas had the lowest rates and those living in the conurbations the next lowest; the highest admission-rates occurred in people living in urban areas with populations under 100,000.

Admission-rates by social class for males aged 20 and over.—Both first-admission and readmission rates were lowest in 1956 in social class II (managerial occupations) and highest among unskilled workers of social class V.

Admissions and discharges for mental-deficiency hospitals.—Admissions and discharges have fluctuated from year to year, but the numbers resident increased from 55,048 in 1951 to 58,799 in 1955, dropping to 58,334 in 1956; this decrease was chiefly due to the discharge of 2406 patients from licence in 1956, compared with 1058 in 1955.

Statistics for Scotland in 1958

In 1958 Scotland's birth-rate was 19·25 per 1000 of the population [4]; this was the highest since 1930, apart from the post-war years. The death-rate rose from 11·9 in 1957 to 12·0 in 1958. Infant mortality amounted to 27·7 per 1000 live births; this is the lowest rate ever recorded in Scotland.

3. The Registrar General's Statistical Review of England and Wales for the Three Years 1954–1956: Supplement on Mental Health. H.M. Stationery Office. Pp. 198. 11*s*. 6*d*.
4. Annual report of the Registrar-General for Scotland, 1958. H.M. Stationery Office. Pp. 489. 25*s*.

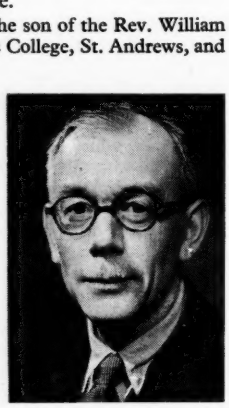
Obituary

JOHN CONSTABLE BROOM

O.B.E., M.D. St. And.

Dr. J. C. Broom, bacteriologist in the Wellcome Laboratories of Tropical Medicine, London, died on March 16. He was 57 years of age.

He was born in Leuchars, Fife, the son of the Rev. William Broom. He was educated at Madras College, St. Andrews, and at St. Andrews University, where he graduated M.B. in 1924. His resident appointments were in the North Lonsdale Hospital, Barrow-in-Furness, and in the Murray Royal Asylum, Perth. In 1929 he took the M.D. and was awarded the Rutherford medal for his thesis.



In 1928 he began his life work as a research bacteriologist in the Wellcome Bureau of Scientific Research, Euston Road, which later became known as the Wellcome Laboratories of Tropical Medicine. For the first fifteen years or so he had as his senior colleague the late Major H. C. Brown, and together they published between 1929 and 1937 a series of valuable studies of the part played by the electric charge in relation to bacteria, protozoa, and the antigen-antibody reactions.

In this work on cataphoresis they showed variations in the migration of different strains of typhoid-salmonella species in the electric field, alterations in the sign of the electric charge of the trypanosomes which reappear after spontaneous cure of laboratory animals, and the alterations in complement fixation, hæmolysis, and bacterial phagocytosis that depend on changes of electric field. In some of the work on trypanosomes they collaborated with Dr. C. A. Hoare, F.R.S. Broom also worked with the late Dr. G. M. Findlay on Rift Valley fever and yellow fever. During the late war, Broom took the main responsibility for the work of inoculation against yellow fever at the Wellcome Laboratories, and for this he was appointed O.B.E. in 1946.

Several years before the war he had joined in H. C. Brown's work on leptospirosis, and from 1939 it became more and more his main subject of study. Since the war he has been the leading worker in this field in Great Britain and one of the group of eminent international students of leptospiral diseases. He made his laboratory a centre of help, advice, and collaboration for workers in many countries where the incidence of leptospirosis has lately been found to be greater than was known.

From 1951 he was secretary of the leptospira subcommittee of the International Committee on Bacteriological Nomenclature. His twenty or more publications on the subject included a most useful system of classification of leptospires (with Prof. J. W. Wolff, of Amsterdam), surveys of the disease in man and rodents in Great Britain, participation in an international symposium in Washington in 1952, and a monograph (with Dr. J. M. Alston) on *Leptospirosis in Man and Animals* (1958). Broom gave the Milroy lectures at the Royal College of Physicians of London in 1952. He has been honorary treasurer of the Royal Society of Tropical Medicine and Hygiene since 1947.

Recalling Broom's early days at the Wellcome Bureau, J. M. A. writes:

"He and Brown were a contrasting pair—the one commanding in voice and figure, full of invention and a cheerful pretence of intolerance, and the other the equally resourceful, younger man who seemed able to rouse his companion to enthusiasm or indignation at will.

"Throughout life Broom's spare figure and clear, alert mind seemed to reflect the bracing influence of a Fife upbringing. He was well read and enjoyed discussion on many general subjects, with a genially critical ear for doubtful conclusions. I well remember an occasion when he carried on a long and lively discussion on the politics of William the Silent with a Dutch professor, and the rest of us were very grateful to him for being able to provide, unprepared, such a suitable subject for our guest.

"We have lost prematurely a scholarly scientist and a modest, stimulating companion."

In 1933 Dr. Broom married Margaret Ethel Curtis, who survives him.

ROBERT KLEIN

M.D. Prague

Dr. Klein, consultant psychiatrist at the Crichton Royal Hospital, Dumfries, died on March 4 at the age of 64.

W. M.-G. writes: "When Klein came to this country in 1939 he was already well known on the Continent as one of the most gifted and promising pupils of Arnold Pick and E. Gamper. His most original contribution at that time was on the function of the parietal lobe, which he considered to be the cerebral centre of integration of the highest developed tool of man: the human hand.

"After some initial difficulties, Klein, who had lost his home, position, and property, adapted relatively well to the life and professional demands of this country. He not only worked as a practising psychiatrist in several hospitals, but also soon returned to his scientific interests, and continued his studies of brain-damaged patients, cerebral tumours and injuries, hæmorrhages and softenings, and carried further his publications of case-material based on minute and refined examinations of the patient's behaviour and performance. His English papers included articles on the biochemistry of short-cycle periodic psychoses, neurological and psychological observations after electroconvulsions, and the immediate effects of prefrontal leucotomy. His manual *Clinical Examination of Patients with Organic Cerebral Disease* (1957) describes his methods of investigation and examination of patients with focal organic lesions and also reports precise differentiations of symptoms based on his own observations.

"Perhaps the most characteristic feature of his working method was his persistent dissatisfaction with what his analysis of symptoms had achieved so far. He stimulated clinical and research work in all hospitals in which he was working, and he was most helpful to younger colleagues. His scholarly personality, quiet and modest, and his unassuming and attentive understanding of his patients earned him respect and admiration."

CHARLES KNIGHT McDONALD

M.D. Edin., D.P.H.

Dr. McDonald, bacteriologist to Lewisham Hospital, died on Feb. 6 at the age of 47.

Dr. McDonald was the elder son of the late Alexander McDonald of Perth, and qualified from the University of Edinburgh in 1936. After holding appointments as assistant bacteriologist and clinical tutor at Edinburgh Royal Infirmary he was appointed county bacteriologist for Ayrshire. From 1945 to 1947 he served with the Friends' Ambulance Unit in China, where he met many hardships. On his return he became pathologist at the Mental Hospitals Group Laboratory at West Park Hospital, and in 1948 he was appointed pathologist at Lewisham group laboratory, where he was in charge of the bacteriological department.

E. N. A. writes: "During his period at Lewisham Dr. McDonald showed a very wide interest in the development of the hospital as a whole, and apart from his bacteriological work, in which he maintained a meticulously high standard, he was

actively concerned in the rebuilding of the hospital, particularly in the organisation of central sterilisation facilities.

"Outside the hospital he had many interests: he was on the local committee of the Labour Party, a governor of the Lewisham Prendergast School, manager of several primary schools, chairman of the Euthanasia Society, and a member of council of the Ethical Union. He was interested in music—classical and jazz—modern art, and the theatre, Shakespeare in particular, and he often visited Stratford.

"He was an individualist, and did not conform to any pattern; his cars were often a surprise to his colleagues—from a sedate Wolseley he graduated to a TR2, followed this by a Heinkel 'bubble car', then a Land Rover (to move gravel and cement at his house at Chislehurst), and finally an Austin A40: we all wondered what would be the next.

"He was a man of very strong character and decided views which he was not afraid to put forward and fight hard for, whatever the majority on the other side. His absolute honesty of purpose made his opponents appreciate his views, even if they disagreed with them. His main personal attribute was one of kindness and sympathy: his relations with all his colleagues were most cordial, and the junior staff found him an approachable and sympathetic friend."

Dr. TOM D. SPIES

P. H. M.-B. writes:

"Your obituary of Tom D. Spies did not sufficiently emphasise the very great contribution he made to the therapeutics of tropical disease.

"His introduction of nicotinic acid for the treatment of pellagra had many, and quite unsuspected, repercussions. It was not in vitamin-B_2 deficiencies alone that nicotinic acid was found to have a place; its use extended to dermatology, otorhinology, and mental disease. The credit for the discovery of folic acid as a specific for tropical sprue and nutritional anæmia must also go to Spies, who first applied it to the treatment of this disease in 1946. Its almost miraculous action was soon recognised and it provided a long-sought remedy. Since its introduction the treatment of tropical sprue has been revolutionised, so much so that this ancient scourge of India and Ceylon has almost disappeared, in contrast to my experiences in my early days, fifty years ago.

"These are some of the reasons why the name of Spies should go down in medical history as one of the benefactors of mankind. It is not only for these very considerable advances in our therapeutic armamentarium that we should honour him, but also for his unfailing courtesy and helpfulness to those on this side of the Atlantic who sought his aid and advice."

Appointments

BENNETT, JACQUELINE, M.B. Birm.: assistant school M.O., Stoke-on-Trent.

DE SOUZA, DAVID, M.B. Leeds: assistant geriatrician (S.H.M.O.), Leeds A and B hospital groups.

DIDSBURY, BRIAN, M.B. Manc., D.P.H.: deputy M.O.H. and deputy principal school M.O., West Ham.

DIGGLE, J. H., M.B., B.SC. Manc., M.R.C.P., D.C.H.: part-time consultant physician (pædiatrics), Boston and Grantham area hospitals.

GRANT, MONICA C., L.R.C.P.E., D.OBST., D.P.H.: assistant M.O.H., Walsall.

NICOL, N. T., M.B. Aberd., F.F.R., D.M.R.T.: consultant radiotherapist, Leicester area hospitals.

RICHARDSON, J. E., M.S. Lond., F.R.C.S.: consultant general surgeon, Royal Masonic Hospital, London.

SMITH, B. H., M.B. Birm., F.F.A. R.C.S.: part-time consultant anæsthetist, United Birmingham Hospitals.

STRIDE, S. D. K., M.R.C.S., F.F.A. R.C.S., D.A.: consultant anæsthetist, Royal Masonic Hospital, London.

TRACEY, SUSAN M., M.R.C.S., D.P.H.: M.O.H., St. Pancras.

WARREN, H. DE B., M.B. Lond., D.P.M.: consultant psychiatrist and deputy physician-superintendent, Naburn and Bootham Park Hospital, York.

East Anglian Regional Hospital Board:

BAXI, A. J., M.B. Bombay: registrar, regional thoracic surgery unit, Papworth Hospital.

CARTMELL, A. T., M.B. Manc.: surgical registrar, Stamford and Rutland Hospital.

GOLD, R. G., M.B. Adelaide, M.R.A.C.P.: medical registrar, regional cardiac unit, Papworth Hospital.

HAGUE, J. M. S., M.B. Lond., F.R.C.S.E.: surgical registrar (casualty), Ipswich and East Suffolk Hospital.

MERRITT, T. J. K., M.B. Lond., D.P.M.: assistant psychiatrist, department of child and family psychiatry, Ipswich and East Suffolk Hospital.

YOUNG, RUTH E., M.B. Lond.: registrar in psychiatry, Fulbourn and Addenbrooke's Hospital, Cambridge.

News

University of London

Mr. G. W. Taylor, reader in surgery at St. Bartholomew's Hospital Medical College, has been appointed to the chair of surgery at that college.

Mr. G. W. Taylor, who is 39 years of age, qualified from St. Bartholomew's Hospital, London, in 1943. After service with the R.A.M.C. he held a house-surgeon appointment at Edgware General Hospital and took the F.R.C.S. in 1948. In 1949 he was appointed research assistant to the surgical professorial unit at St. Bartholomew's Hospital, and in 1950 as a Fulbright scholar was awarded a surgical fellowship at Stanford University, San Francisco. In 1951 he was appointed chief assistant in the surgical professorial unit at Barts. In 1952 he was awarded the B.M.A. Walter Dixon research scholarship, and in 1955 he took the M.S. degree. He was appointed to his readership in 1955. His published work includes papers on peripheral vascular disease, lymphœdema, and wound infection.

The title of professor of hæmatology in the university has been conferred on Dr. W. M. Davidson in respect of his post at King's College Hospital Medical School.

Dr. Davidson, who is 50 years of age, qualified from the University of Aberdeen in 1934. After holding appointments in Aberdeen Royal Infirmary he became lecturer in pathology in the university. He served with the R.A.M.C. throughout the war. In 1948 he was appointed clinical pathologist to King's College Hospital and Medical School. In 1957 he took the degree of M.D. Aberd. with honours. His published papers include investigations on congenital anomalies, on iron storage and anæmia, and on a morphological sex difference in the polymorphonuclear neutrophil leucocytes. He has also contributed chapters to *Rose & Carless' Surgery*.

The title of professor of bacteriology in the university has been conferred on Dr. A. C. Cunliffe in respect of his post at King's College Hospital Medical School.

Dr. Cunliffe, who is 47 years of age, was educated at Rugby School, the University of Cambridge, and St. George's Hospital. After qualifying in 1937 he worked at the London County Council's central histological laboratory. In 1940 he was appointed assistant pathologist in the Emergency Medical Services. From 1941 to 1943 he was demonstrator and from 1943 to 1946 assistant lecturer in bacteriology at University College Hospital Medical School. In 1946 he went into the Army as a specialist in pathology and was appointed a lecturer in pathology at the Royal Army Medical College, Millbank. After he was demobilised in 1948 he became bacteriologist at King's College Hospital and senior lecturer in the Medical School. He was appointed reader in 1949. He is secretary of the Medical Research Council's committees on control of cross-infection and on sterilisation of syringes. His published work includes papers on hospital infection of war wounds, epidemiology of carrier states and infections by staphylococci and proteus, and the immune response to diphtheria and tetanus toxoid.

The title of reader in oral anatomy in the university has been conferred on Dr. H. J. J. Blackwood in respect of his post at the Royal Dental Hospital of London School of Dental Surgery.

University of Leeds

Dr. D. R. Wood has been appointed to the chair of pharmacology from Sept. 1.

Dr. Wood was educated at Brasenose College, Oxford, and after graduating B.A. in 1942 he held a demonstratorship in the department of pharmacology at Oxford while continuing his medical studies. He graduated B.M. in 1945, and in the following year became lecturer of pharmacology and therapeutics at the University of Sheffield. In 1952 he was appointed senior lecturer. The year 1955–56 he spent as senior research fellow in the department of pharmacology at Yale Medical School. In 1957 he gave up his lectureship in Sheffield to take up his present appointment as associate professor of pharmacology at McGill University, Montreal.

The degree of CH.M. has been awarded to F. G. Smiddy.

University of Aberdeen

Dr. Campbell Murray has been appointed second medical officer to the student health service.

University of Edinburgh

On July 7 the honorary degree of LL.D. will be conferred on Sir David Henderson.

University of St. Andrews

Dr. Gordon Sprunt has been appointed lecturer in therapeutics in the department of pharmacology and therapeutics, Queen's College.

Royal College of Surgeons of England

On Thursday, April 14, at 5 P.M., at the college, Lincoln's Inn Fields, London, W.C.2, Mr. Leon Gillis will give a Joseph Henry lecture. He will speak on arm prostheses and appliances and their functional value in industry.

British Tuberculosis Association

The provincial meeting of this Association will be held on Friday and Saturday, April 8 and 9, at the University of Southampton. Further particulars may be had from the Association, 59, Portland Place, W.1.

The Middlesex Hospital

The board of governors of this hospital have received from Major and the Hon. Mrs. Macdonald-Buchanan a gift of £140,000 to build a new training school for student nurses. The board own the site for the new building, which will adjoin the main nurses' home. It is hoped that the school will be ready for use within two years.

World Health Day Exhibition

To celebrate World Health Day this year, the United Kingdom Committee for the World Health Organisation has arranged an exhibition of material to publicise the work of the W.H.O. The exhibition will be open at the Charing Cross exhibition site from April 4 to 23 daily (except Sunday and Good Friday) from 11 A.M. to 7 P.M.

First International Congress of Nephrology

This congress, organised by the Renal Association, la Société de Nephrologie, the Scandinavian Society for Kidney Research, the American Society for Clinical Investigation, and the Societa Italiana di Nefrologica, will be held at Geneva and Evian (France) from Sept. 1 to 4. Particulars may be had from Dr. A. A. G. Lewis, secretary of the Renal Association, c/o the Ciba Foundation, 41, Portland Place, London, W.1.

New Hearing and Speech Centre

The Nuffield Foundation have offered a grant of £60,000 to build a centre, attached to the Royal National Throat, Nose and Ear Hospital and the associated Institute of Laryngology and Otology, for the diagnosis, assessment, and development of hearing and speech in children with impairment or total loss of these faculties, for research into congenital and acquired deafness, and for training of doctors and other professional workers.

Medical Society of London

As principal guest at the dinner on March 17, Sir Arthur Bryant ranged gaily over the centuries.

Advice to a young man starting medicine in the 1300s was that he should be careful not to pronounce upon a case " until he has seen it and knows what it is ". The patient with measles was recommended to go to bed with a live sheep; for these animals are easily infected and draw the venom to themselves. As a farmer, Sir Arthur felt that if the colleges could be induced to prescribe this remedy, it would be an enormous help to our struggling agriculture. Our ancestors he said, had a sense that everything in the Universe was linked to everything else: the flowers, the tides, and the seasons were all part of one design. Contemplating the lot of man today, strap-hanging in the Tube and subjected to the noise and other trauma of work and home, he wondered whether environment had not something to do with failures in health. The medical profession should sometimes corporately tell our rulers that their purpose should be to enable man to live according to his own nature.

Dr. R. Cove-Smith, the president, spoke of the society's excellent sessions and continuing liveliness. Mr. Guy Blackburn wittily proposed The Visitors; and Dr. G. F. Abercrombie, president of the College of General Practitioners, remarked that, if there is any difficulty about disposing of the £500,000 that the Royal Commission proposes for distinction awards to practitioners, a possible destination might be the college's appeal.

Empire Rheumatism Council

The Council has received a grant of £23,000 from the Geigy Pharmaceutical Co., Ltd., which will be used over the next seven years for travelling fellowships to be awarded in alternate years to research-workers in Britain and in other parts of the Commonwealth.

International Congress of Pædiatrics

This congress will be held in Lisbon from Sept. 9 to 15, 1962. Further particulars may be had from the congress secretariat, Clinica Pediatrica Universitária, Hospital de Santa Maria, Avenida 28 de Maio, Lisbon, 4, Portugal.

Pure Food Centenary

A conference to celebrate the centenary of the Adulteration of Articles of Food and Drink Act of 1860 is to be held in London from Sept. 20 to 23. It is being sponsored by the appropriate Government departments and scientific societies. The programme includes a paper by Prof. A. C. Frazer on the integration of food research. Further particulars may be had from the secretariat of the centenary, 14, Belgrave Square, London, S.W.1.

During Sir Harry Platt's recent visit to Peru, Chile, and Colombia on behalf of the British Council, he was elected an honorary member of the Peruvian Academy of Surgery, the Society of Surgeons of Chile, the Chilean Society of Orthopædics and Traumatology, and the Sociedad Latino-Americana de Ortopedia y Traumatologia.

Mr. J. D. Martin, first assistant in the obstetric unit, University College Hospital, London, has been appointed senior assistant to the professor of obstetrics and gynæcology, University of Western Australia.

Mr. S. Alan S. Malkin has been appointed a member of the Industrial Injuries Advisory Council.

The spring dinner of the Wessex Rahere Club will be held on Saturday, April 30, at the White Hart Hotel, Salisbury. The secretary of the club is Mr. A. Daunt Bateman, 11, The Circus, Bath.

British Standard (B.S.3215 : 1960) specifies requirements for glass urine bottles of 850 ml. (30 fl. oz.) capacity for male patients. An appendix gives notes on the handling of glass urine bottles during cleaning and disinfection. Copies (3*s*.) may be had from the Sales Branch, British Standards Institution, 2, Park Street, London, W.1.

CORRIGENDUM: *Bronchography: a Neglected Investigation?*—Dr. Davies asks us to say that in this paper the amount of sucrose used in preparation of the Amethocaine Lozenges should have been given as 5 ounces and 212·5 grains.

Diary of the Week

MARCH 27 TO APRIL 2

Monday, 28th

ROYAL COLLEGE OF SURGEONS OF ENGLAND, Lincoln's Inn Fields, W.C.2
5 P.M. Dr. R. A. Weale: Duplicity Theory of Vision. (Edridge-Green lecture.)

MANCHESTER MEDICAL SOCIETY
9 P.M. (Medical School, University of Manchester.) *General Practice.* Dr. R. S. F. Schilling: Chronic Respiratory Disease in Cotton Workers.

Tuesday, 29th

ROYAL STATISTICAL SOCIETY
5.30 P.M. (London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1.) Dr. C. A. B. Smith: Statistical Problems in Human Genetics.

LEEDS NEUROLOGICAL SCIENCES COLLOQUIUM
5.15 P.M. (General Infirmary at Leeds.) Prof. Ludo van Bogaert (Antwerp): Disseminated Sclerosis, Today's Great Imitator.

Wednesday, 30th

ROYAL COLLEGE OF SURGEONS OF ENGLAND
5 P.M. Mr. J. D. Griffiths: Dissemination of Cancer Cells During Operative Procedures. (Hunterian lecture.)

Thursday, 31st

ROYAL COLLEGE OF SURGEONS OF ENGLAND
5.30 P.M. Mr. D. W. C. Northfield: Brain Tumours.

MANCHESTER MEDICAL SOCIETY
8 P.M. (Medical School, University of Manchester.) *Anæsthetics.* Dr. Frankis Evans: Mistakes I Have Made.

Friday, 1st

ROYAL SOCIETY OF MEDICINE, 1, Wimpole Street, W.1
5.30 P.M. *Anæsthetics.* Dr. D. H. P. Cope, Dr. D. E. Argent, and Dr. P. H. Buxton: Hypoxia.

INSTITUTE OF LARYNGOLOGY AND OTOLOGY, 330, Gray's Inn Road, W.C.1
3.30 P.M. Mr. William McKenzie: Aural Vertigo—Management.